70p

Easy 6502 machine code

YOUR COMPUTER

APRIL 1983 BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE Vol. 3 No. 4

BBC Buggy road test – first small step for home robots

Reviews:
£98 Texet colour micro
Dragon software
Death Duel
Spectrum



Snaking on the Vic

ZX-81 file system

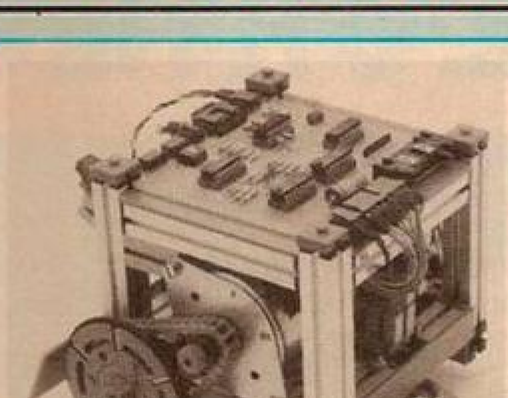
Plus plenty of games and features for the BBC, Ace, Atari and Dragon

Win the new colour Texet


SPECTRUM
The World's Greatest Arcade games
ZX81(16k)
ZX SPECTRUM
VIC 20 (ANY MEMORY)
GAMES FOR ORIC & DRAGON AVAILABLE SOON
£2.00 OFF ANY TWO GAMES
From our team of outstanding program experts
come games crammed with excitement for hours of fun
HI-RESOLUTION GRAPHICS
SENSATIONAL SOUND EFFECTS
FAST LOADING MACHINE CODE THRILLS
SPECIAL SKILL LEVELS
HALL OF FAME
MISSILE ATTACK
THE ULTIMATE EXPLOSIVE CHALLENGE
ALSO
MONSTER MUNCHER
Ghosts energizers
and a secret escape
Hopper
authentic arcade
action
ANY GAME JUST £5.50
INCLUDES V.A.T. AND 1st CLASS POST
AND PACKING
GUARANTEE
ANY FAULT, YOUR GAME WILL
BE REPLACED COMPLETELY FREE
SPECTRUM GAMES
FREEPOST MANCHESTER M3 8BB
SAME DAY CREDIT CARD SALES
Access
061-832 9143. (24 HOURS)
DEALER ENQUIRIES INVITED
POST COUPON NOW TO
SPECTRUM GAMES
FREEPOST Manchester M3 8BB
PLEASE RUSH ME A COPY OF
ZX SPECTRUM (16k or 48k)
ZX81 (16k)
VIC 20 (Any Memory)
MONSTER MUNCHER
HOPPER
MISSILE ATTACK
SPECIAL OFFER – SAVE ON TWO!!
SAVE £2.00 ON ANY 2 GAMES PAY ONLY £9.00
I enclose a cheque/P.O. for £.....................
or please debit my Access Card.
No.
NAME
Address
FREE POST – NO STAMP NECESSARY

YOUR COMPUTER Contents

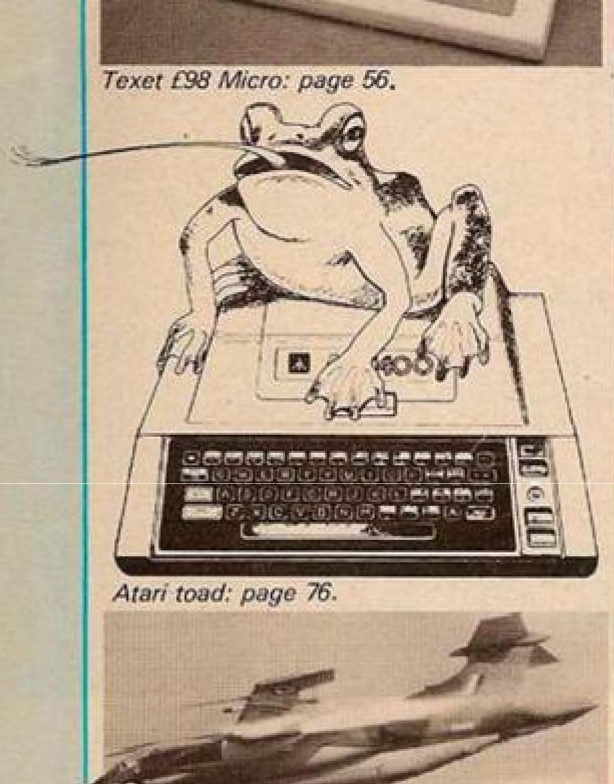
APRIL 1983



BBC Buggy: page 50.



Texet £98 Micro: page 56.

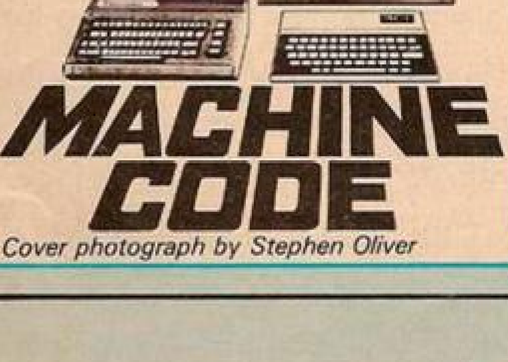


Atari toad: page 76.



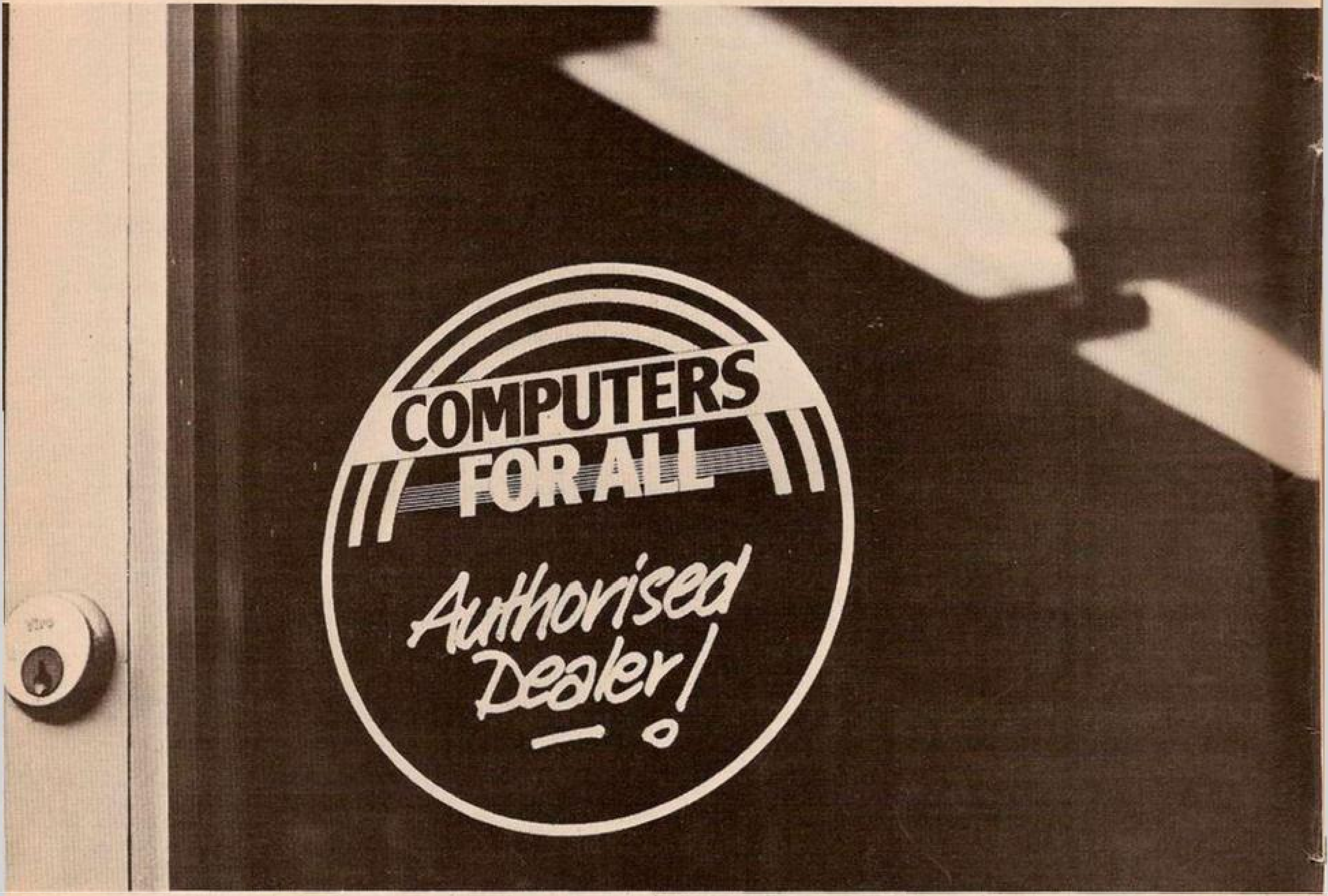
ZX-81 Ground strike: page 84.

6502 machine code series: page 103.



Cover photograph by Stephen Oliver

IF YOU WANT PROFESSIONAL DEALER THERE'S A NEW



From now on, you won't have to look far for a totally professional home computer dealer. Just look for the name that says it all. **COMPUTERS FOR ALL**

It's the newest and most exciting network of Micro dealers in the U.K. The ideal places to buy, browse, seek advice and after-sales service . . . professional service!

Every COMPUTERS FOR ALL dealer is dedicated to giving you, the customer, exactly what you have always wanted . . . a shop or store that knows about computers, capable of helping you sort out what's right for your needs; expertise in giving sound advice, knowledgeable in technical matters.

If you've ever bought from the usual retailer who just stocks and sells, you'll appreciate the difference!

A COMPUTERS FOR ALL dealer is a shop where people matter . . . why not call in at your local one today. You'll get a friendly welcome!

SERVICE FROM A COMPUTER NAME TO LOOK FOR:

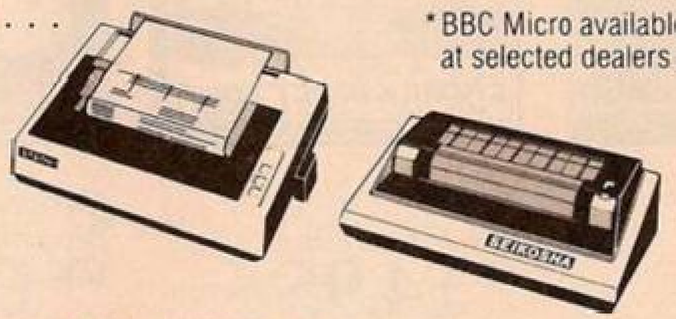


FRIENDLY SERVICE AND THE WORLD'S FINEST MICROS!

You'll find a wide range of popular Micros at a COMPUTERS FOR ALL dealer.
Atari 400 and 800, Sinclair ZX Spectrum, DRAGON 32, SORD M5, MPFII, Commodore 64, Oric I (48K) and BBC Micro* to name a just few!
Plus of course, the sort of dealer who can (and will) explain which one is best for your needs!

HARDWARE, SOFTWARE TOO!

A COMPUTERS FOR ALL dealer also stocks a great deal of the very best hardware and software, so that you can expand into new worlds of computing.
Everything from equipment like EPSON and SEIKOSHA printers to a fantastic new range of ATARI software direct from the U.S.A.!
Of course, you'll also find lots of other items of interest at a COMPUTERS FOR ALL dealer.
Books, BBC Software, DRAGON 32 Software . . . the list is endless!
Call now at your local shop or store.
Look for the name that says it all . . .
COMPUTERS FOR ALL



*BBC Micro available at selected dealers only.

Where to find your COMPUTERS FOR ALL DEALER

AKHTER INSTRUMENTS LTD
Unit 19, Arlinghyde Estate
South Road, Harlow, Essex
0279-412639

ANIROG COMPUTERS
26 Balcombe Gardens
Horley, Surrey 02934 6083

APHROS SOFTWARE CO.
83 Canterbury Road
Westbrook, Margate, Kent
0843 23627

AUTOMATION SERVICES (S.Wales)
3 Wermeys Road, Penysfai
Bridgend, S. Wales
0656 720959

BITS & BYTES
44 Fore Street, Ilfracombe
Devon 0271-62801

CARLTON COMPUTERS
4 Swanstons Road
Great Yarmouth, Norfolk
0493-58898

COMPUTASOLVE
8 Central Parade
St. Marks Hill, Surbiton
Surrey 01-390 5135

COMPUTER CORNER
The Wickford Video Co.
15 The Broadway, Wickford
Essex 03744-3710

COMPUTER SYSTEMS (TORBAY)
Pump Street, Brixham, Devon
08045-6565/6

COMPUTERS FOR ALL
72 North Street
Romford, Essex
0708-752862 (two lines)

CRYSTAL COMPUTERS
209 Union Street, Torquay
Devon 0803-22699

DAN EVANS (BARRY) LTD.
81 Holton Road
Barry, South Glamorgan
0446-734242

D. V. MARTIN LTD.
13 Bridge Street, Belfast
N. Ireland 0232-226434

EMPRISE LTD.
58 East Street, Colchester
Essex 0206-870353

EMPRISE LTD.
3a Baddow Road, Chelmsford
Essex 0245-356834

EUROCALC
224 Tottenham Court Rd
London W1 01-631 4139

FAL-SOFT COMPUTERS
8 St. George's Arcade
Falmouth, Cornwall
0326 314663

HOME COMPUTER CENTRE (ROSS RECORDS)
13 Kingston Road, Portsmouth
Hants 0703-819515

IMPULSE MICRO SYSTEMS LTD
6 Central Chambers
Cooks Alley, Wood Street
Stratford-upon-Avon
0789 295819

JADE COMPUTERS
Coombend, Radstock
Bath, Avon 0761-32570

KELLY'S COMPUTERMARKET
227 Dartmouth Road
Sydenham, London SE26 4QY
01-699 4399/6202

KENNETH WARD COMPUTERS
Verve House, London Road
Sunningdale, Berkshire
0990-22275

MEDWAY COMPUTERS
141 New Road, Chatham
Kent 0634-826080

MERCATOR COMPUTER SYSTEMS
3 Whiteladies Road, Clifton
Bristol 0272-731079

MOBILE MICROS
2 Castle Street, Thornbury
Bristol 0454-418383

STEVE'S COMPUTER CO. LTD.
Castle Arcade, Cardiff
South Glamorgan 0222-41905

THE COMPUTER CENTRE (BMS) LTD.
37d & 37e Robertson Street
Hastings, East Sussex
0424 439190

TWILLSTAR COMPUTERS
17 Regina Road, Southall
Middlesex 01-574 5271

WEYTECH COMPUTER SYSTEMS
20 St. Edmunds Street
Weymouth, Dorset
03057-79881

COMPUTERS FOR ALL

"THE SHOP WHERE PEOPLE MATTER"

You know that Spectrum software is easily affordable.

Now W.H.Smith make it easily available.



Meteor Storm
Quicksilva
16K £4.95



Escape
New Generation
16K £4.95



Ground Attack
Silversoft
16K £5.95



Orbiter
Silversoft
16K £5.95



Space Raiders
Sinclair
16K £4.95



Flight Simulation
Sinclair
48K £7.95



Horace Goes Skiing
Sinclair
16K £5.95



Battle of Britain
Microgame
48K £5.95

When it comes to software for the Sinclair Spectrum, there's no question who's right up your street. W. H. Smith.

Our range already covers some 65 programs. And it's growing fast.

So fast that every month we select and illustrate a Top Ten to keep you informed of the programs which are proving to be the most popular.

If on the other hand you've already got the Top Ten then why not come in and browse through the rest of our range.



Chess
Sinclair 48K
£7.95

The Hobbit
Sinclair 48K
£14.95 Double Tape plus book

W. H. Smith Spectrum Software Library

(all 16K programs will run on 48K machines)

Title	Producer	K RAM	Price
Arcade Games			
Space Intruders	Quicksilva	16	£4.95
Time Gate	Quicksilva	48	£6.95
Mined Out	Quicksilva	48	£4.95
Gulpman	Campbell	16	£4.95
Spectral Invaders	Bug-Byte	16	£5.00
Avenger	Abacus	16	£4.95
Meteoroids	Softek	16	£4.95
Planetoids	Sinclair	16	£4.95
Hungry Horace	Sinclair	16	£5.95
Mazeman	Abersoft	16	£4.95
Nightflight	Hewson	48	£5.95
Ground Force Zero	Titan	16	£5.00
Caterpillar	CDS	16	£5.95
Leapfrog	CDS	16	£5.95
Gobble-A-Ghost	CDS	16	£5.95
Centi-Bug	DK Tronics	16	£4.95
3D-Tanx	DK Tronics	16	£4.95
Penetrator	Melbourne Hse	48	£6.95
Cruising	Sunshine	16	£4.95
Arcadia	Imagine	16	£5.50
Derby Day	Computer Rentals	16	£5.95
Jackpot	Computer Rentals	16	£4.95
3D-Tunnel	New Generation	16	£4.95
Gobbleman	Artic	16	£4.95
Galaxians	Artic	16	£4.95
Sentinal	Abacus	16	£4.95
Cyber Rats	Silversoft	16	£5.95
Strategy Games			
Novotnik Puzzle	Phipps	16	£4.95
Chess	Artic	48	£9.45
Voice Chess	Artic	48	£9.95
Football Manager	Addictive	48	£6.95
Chess-The Turk	Oxford	48	£8.95
Adventure			
Labyrinth	Axis	16	£5.95
Planet of Death	Sinclair	48	£6.95
Inca Curse	Sinclair	48	£6.95
Ship of Doom	Artic	48	£6.95
Espionage Island	Artic	48	£6.95
The Orb	Computer Rentals	48	£5.95

Title	Producer	K RAM	Price
Utility			
M/C Code Test Tool	Oxford	16	£9.95
Compiler	Softek	16	£14.95
Family Games			
Reversi	Sinclair	16	£7.95
Othello	CDS	16	£5.95
Golf	R and R	16	£3.75
Conflict	Martech	48	£11.95
Practical			
Vu-Calc	Sinclair	16	£8.95
Vu-File	Sinclair	16	£8.95
Vu-3D	Sinclair	48	£9.95
Collectors Pack	Sinclair	48	£9.95
Club Record Controller	Sinclair	48	£9.95
Address Manager	Oxford	16	£8.95
Dietron	Custom Data	16	£4.75
Program Collections			
Shiva Special 1	Shiva	16	£5.95
Over The Spectrum 1	Melbourne Hse	16	£5.95
Over The Spectrum 2	Melbourne Hse	16	£5.95
Over The Spectrum 3	Melbourne Hse	16	£5.95

WHSMITH

Prices correct at time of going to press. Subject to availability. At selected branches only.



The Samurai* home computer is coming...

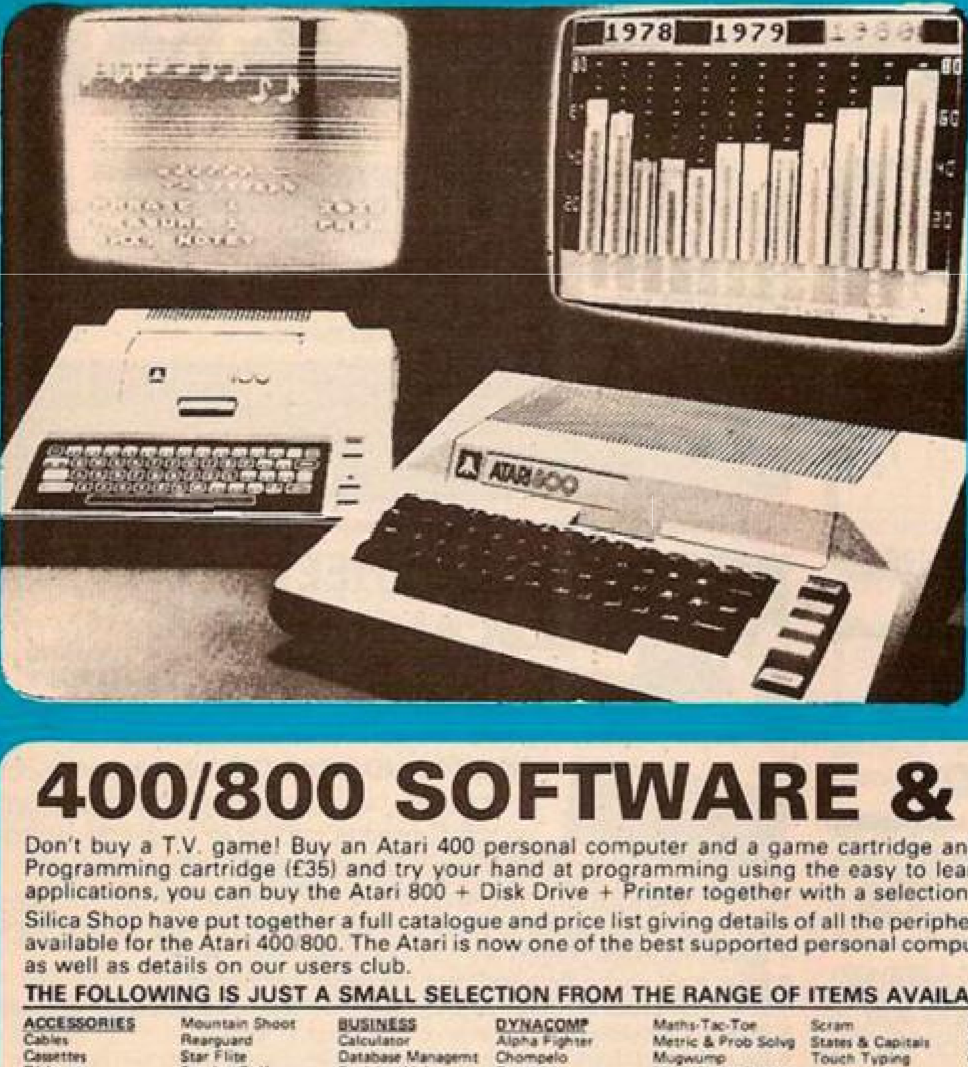
*Samurai is a trademark of Samurai Worldwide Ltd

100 FREE PROGRAMS

FROM SILICA SHOP — WITH EVERY PURCHASE OF AN

ATARI 400 800

ATARI



REDUCED PRICES!

We at Silica Shop are pleased to announce some fantastic reductions in the prices of the Atari 400 800 personal computers. We believe that the Atari at its new price will become the U.K.'s most popular personal computer and have therefore set up the Silica Atari Users Club. This club already has a library of over 500 programs and with your purchase of a 400 or 800 computer we will give you the first 100 free of charge. There are also over 350 professionally written games and utility programs, some are listed below. Complete the reply coupon and we'll send you full details. Alternatively give us a ring on 01-301 1111 or 01-309 1111.

ATARI 400 with 16K	**£159**
ATARI 400 with 48K	**£228**
ATARI 800 with 48K	**£349**

400/800 SOFTWARE & PERIPHERALS

Don't buy a T.V. game! Buy an Atari 400 personal computer and a game cartridge and that's all you'll need. Later on you can buy the Basic Programming cartridge (£35) and try your hand at programming using the easy to learn BASIC language. Or if you are interested in business applications, you can buy the Atari 800 + Disk Drive + Printer together with a selection of business packages.

Silica Shop have put together a full catalogue and price list giving details of all the peripherals as well as the extensive range of software that is now available for the Atari 400/800. The Atari is now one of the best supported personal computers. Send NOW for Silica Shop's catalogue and price list as well as details on our users club.

THE FOLLOWING IS JUST A SMALL SELECTION FROM THE RANGE OF ITEMS AVAILABLE:

ACCESSORIES
Cables
Cassettes
Diskettes
Joysticks
Le Stick - Joystick
Misc Supplies
Paddles

ADVENTURE INT
Scott Adams Adv
No 1 Adventureind
No 2 Pirate Adv
No 3 Mission Imp
No 4 Voodoo Cast
No 5 The Count
No 6 Strange Ody
No 7 Mystery Fun
No 8 Pyramid of D
No 9 Ghost Town
No 10 Sav Island 1
No 11 Sav Island 2
No 12 Golden Voy
Angle Worms
Deflections
Galactic Empire
Galactic Trader
Lunar Lander
Mountain Shoot
Rearguard
Star Flite
Sunday Golf

AUTOMATED SIMULATIONS
Crush Crumble Cmp
Datestones of Ryn
Dragons Eye
Invasion Orion
Rescue at Rigel
Ricochet
Star Warrior
Temple of Apshai
Upper Reaches Aps

BOOKS
Basic Ref Manual
Compute Atari DOS
Compute Bk Atari
Compute Magazine
De Re Atari
DOS Utilities List
DOS2 Manual
Misc Atari Books
Op System Listing
Wiley Manual

BUSINESS
Calculator
Database Managemt
Decision Maker
Graph-It
Invoicing
Librarian
Mort & Loan Anal
Nominal Ledger
Payroll
Personal Finl Mgmt
Purchase Ledger
Sales Ledger
Statistics 1
Stock Control
Telelink 1
Visicalc
Weekly Planner
Word Processor

CRYSTALWARE
Beneath The Pyram
Fantasyland 2041
Galactic Quest
House Of Usher
Sands Of Mars
Waterloo
World War III

DYNACOMP
Alpha Fighter
Chompelo
Crystals
Forest Fire
Intruder Alert
Monarch
Moonprobe
Moving Maze
Nominoes Jigsaw
Rings of The Emp
Space Tilt
Space Trap
Stud Poker
Triple Blockade

EDUCATION from APX
Algicalc
Atlas of Canada
Cubbyholes
Elementary Biology
Frogmaster
Hickory Dickory
Inst Comptg Dem
Lemonade
Letterman
Mapware
Maths-Tac-Toe
Metric & Prob Solvg
Mugwump
Music Terms/Notatn
Musical Computer
My First Alphabet
Number Blast
Polycalc
Presidents Of U.S.
Quiz Master
Starware
Stereo 3D Graphics
Three R Math Sys
Video Math Flash
Wordmaker

EDUCATION from ATARI
Conv French
Conv German
Conv Italian
Conv Spanish
Energy Czar
European C & Caps
Hangman
Invit To Prog 1/2/3
Kingdom
Music Composer
Scram
States & Capitals
Touch Typing

EMI SOFTWARE
British Heritage
Cribbage/Dominoes
Darts
European Scene Jig
Hickory Dickory
Humpty Dumpty
Jumbo Jet Lander
Snooker & Billiards
Submarine Commdr
Super Cubes & Tilt
Tournament Pool

ENTERTAINMENT from APX
Alien Egg
Anthill
Attank
Avalanche
Babel
Blackjack Casino
Block Buster
Block 'Em
Bumper Pool
Castle
Centurion
Checker King
Chinese Puzzle
Codecracker
Comedy Diskette
Dice Poker
Dog Daze
Domination
Downhill
Eastern Front
Galahad & Holy Grl
Graphics/Sound
Jax-O
Jukebox
Lookahead
Memory Match
Midas Touch
Minotaur
Outlaw/Howitzer
Preschool Games
Pro Bowling
Pushover
Rabbotz
Reversi II
Salmon Run
747 Landing Simul
Seven Card Stud
Sleazy Adventure
Solitaire
Space Chase
Space Trek
Sultans Palace
Tact Trek
Terry
Wizards Gold
Wizards Revenge

ENTERTAINMENT from ATARI
Asteroids
Basketball
Blackjack
Centipede
Chess
Entertainment Kit
Missile Command
Pac Man
Space Invaders
Star Raiders
Super Breakout
Video Easel

ON LINE SYSTEMS
Crossfire
Frogger
Jawbreaker
Mission Asteroid
Mouskattack
Threshold
Ulysses/Golden Fl
Wizard & Princess

PERIPHERALS
Centronics Printers
Disk Drive
Epsom Printers
Program Recorder
RS232 Interface
Thermal Printer
16K Memory RAM
32K Memory RAM

PERSONAL INT from APX
Adv Music System
Banner Generator
Blackjack Tutor
Going To The Dogs
Keyboard Organ
Morse Code Tutor
Personal Fitness Prg
Player Piano
Sketchpad

PROGRAMMING AIDS from Atari
Assembler Editor
Dsembler (APX)
Microsoft Basic
Pascal (APX)
Pilot (Consumer)
Pilot (Educator)
Programming Kit

SANTA CRUZ
Basics of Animation
Bobs Business
Display Lists
Graphics Machine
Kids 1 & 2
Horizontal Scrolling
Master Memory Map
Mini Word Processor
Page Flipping
Player Missile Gr
Player Piano
Sounds
Vertical Scrolling

SILICA CLUB
Over 500 programs write for details

FOR FREE BROCHURES — TEL: 01-301 1111

For free brochures and reviews on our range of electronic products, please telephone 01-301 1111. To order by telephone, just quote your name, address, credit card number and order requirements and leave the rest to us. Post and packing is FREE OF CHARGE in the UK. Express 24 hour delivery available at an additional charge.

- SHOP DEMONSTRATION FACILITIES — we provide full facilities at our shop in Sidcup Monday to Saturday 9am to 5.30pm (closing Thursday 1pm, Friday 8pm).
- MAIL ORDER — we are a specialist mail order company and are able to supply goods direct to your door.
- MONEY BACK UNDERTAKING — if you are totally unsatisfied with your purchase, you may return it to us within 15 days. On receipt of the goods in satisfactory condition we will give you a full refund.
- PART EXCHANGE SECOND HAND MACHINES — we offer a part exchange scheme to trade in many makes of T.V. game for personal computers.
- COMPETITIVE PRICES — our prices, offers and service are very competitive. We are never knowingly undersold and will normally match any lower price quoted by our competitors.
- HELPFUL ADVICE — available on the suitability of various computers.
- AFTER SALES SERVICE — available on all computers out of guarantee.
- VAT — all prices quoted above include VAT at 15%.
- CREDIT FACILITIES — we offer credit over 12, 24 or 36 months, please ask for details.

SILICA SHOP LIMITED
Dept. YC0483, 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX. Telephone 01-301 1111 or 01-309 1111.

SILICA SHOP

FREE LITERATURE

I am interested in purchasing an Atari 400/800 computer and would like to receive copies of your brochures and test reports as well as your price list covering all of the available Hardware and Software:

Name ....

Address ....

....

....

Postcode ....

YC0483 — Your Computer — April 1983

GEMIN

PERFORMANC

It can do a powerful job for yo

SPECIAL LIMITED OFFER

Buy just any two programs at £19.95 and take one at £19.95 FREE!

CASH BOOKS ACCOUNTS PROGRAM FOR BBC MICRO . . .£95.00

New

One of the most innovative business programs on the market. Most serious accountancy packages are written and coded by professional and competent programmers. The Gemini Cashbook Accounting program was written by practising Chartered Accountants and coded by professional and competent programmers. This is a fundamental difference.

This practical program is simple to use and will replace your manual cash and bank records and by giving you instant management information, it may even put your accountant out of job!

With exceptionally exhaustive user documentation, full technical back up and product update policy this program will increase the efficiency and profitability of your business. Take a look at the information this program will provide.

* summary of VAT information to enable you to complete your VAT returns
* cumulative receipts and payments report analysed over the standard profit and loss and balance sheet heading.
* option for departmental analysis of sales and purchases
* print out of all transactions
* journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc.
* year end trial balance
* profit and loss account and balance sheet.

These statements can be produced at what ever interval you require e.g. monthly, quarterly or annually.

Coming soon:– Integrated Sales + Purchase Ledgers

"... the systems worked immaculately when tested ..."
"Mailist is a very professional piece of software ..."
(Which Micro & Software Review Feb 83)

Here's a range of software for the independent businessman that's designed to harness the power of your micro to deliver the vital information you need in all key areas of your business. A breakthrough on both price and performance, each program is fully tested and comes with all the documentation back up you need.

"Gemini's range of software is in the vanguard of the releases for 'serious' micro users . . ."
(Which Micro and Software Review)

SPREADSHEET ANALYSIS
BEEBCALC £19.95
DRAGONCALC £19.95

New

FOR BBC AND DRAGON 32. Spreadsheet processors have proved to be important tools for using micros in business, scientific and domestic financial applications.

Without any programming knowledge at all, you may:–
* Set up a computerised spreadsheet, with chosen row and column names.
* Specify formulae relating any row or column to any other.
* Enter your source data and have the results calculated.
* Save the results on tape (or disk – BBC) for later reloading and manipulation.
* Print the tabulated results in an elegant report format.
* Experienced users may access saved files and write their own reporting or graphics presentation programs for the results.

Some typical applications:–
* Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
* Investment project appraisal – anything from double glazing to oil rigs!
* Comparing rent/lease/buy options
* Processing the results of scientific experiments or field studies
* Engineering calculation models
* In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:–

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts
Sinclair Spectrum 16k or 48k	●	●	●					●	●
Dragon 32k or 64k	●				●			●	
VIC20 (16k+)	●	●	●	●				●	●
Sinclair ZX81 (16k+)	●								
Grundy Newbrain	●								
Texas TI99-4A	●								
Osborne 1	●								
Sharp MZ80A	●	●	●	●				●	●
Sharp MZ80K	●	●	●	●				●	●
Sharp MZ80B	●	●	●	●				●	●
BBC micro model A or B 32K	●	●	●	●	●	●	●	●	●

I'S NEW
CE SOFTWARE
ur business at petty cash prices.

INVOICES AND STATEMENTS . . . £19.95

Compatible with most micros. See table. Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations include VAT automatically, and the program allows your own messages on the form produced. This program gives you superb presentation and saves time on one of the most tedious tasks in the office.

COMMERCIAL ACCOUNTS . . . £19.95

Compatible with most micros. See table. A gem of a program, all for cassette, with the following features:– Daily Journal. Credit Sales. Cash Sales. Credit Purchases. Purchases – other. Sales Ledger. Purchase Ledger. Bank Account. Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to an[illegible]r on cassette. Particularly useful from a cash flow point of view, [illegible] immediate accessibility to totals for debtors and creditors. Bank [illegible] supported with entries for cheque numbers, credits and, of [illegible], running balance.

MAILING LIST . . . £19.95

Compatible with most micros. See table. A superb dedicated database to allow for manipulations of names and addresses and other data. Gemini's unique 'searchkey' system gives you a further ten 'user-defined parameters' to make your own selections. Features include the facility to find a name or detail when only part of the detail is known, it will print labels in a variety of user specified formats.

DATABASE . . . £19.95

Compatible with most micros. See table. The program that everyone needs, the most valuable and versatile in your collection. Facilities include sort search, list print if required. Can be used in place of any card index application; once purchased you can write your own dedicated database to suit your particular needs with a limitless number of entries on separate cassettes.

STOCK CONTROL . . . £19.95

Compatible with most micros. See table. Dedicated software with all that's necessary to keep control of stock. This program will take the tedium out of stock control and save time and money. Routines include stock set up, user reference number, minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more.

HOME ACCOUNTS . . . £19.95

Compatible with most micros. See table. Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account mortgage, H.P. etc. This program also allows you to plot graphically by Listograms your monthly outgoings.

WORD PROCESSOR . . . £19.95

Compatible with most micros. See table. This program features routines found in much larger and more expensive packages with a typical word length of 5-6 letters it allows for around 1000 words in memory at one time. Ideal for the user who requires a simple program to write letters on his computer. Features include, block delete, block insert, search and replace, edit text, display text and more.

Dealer/Trade enquiries invited – generous trade discounts for quantity

Special ACCESS card instant sales hotline for GUARANTEED despatch within 24 hours . . . Tel: 03952-5165

24 hr Ansaphone Service.

All enquiries other than credit card sales to 03952-5832

Gemini. Functional Software Specialists. 9, Salterton Road, Exmouth, Devon.

Tick the box for Program you require. Prices include V.A.T. and Package and Postage.
Please supply the following cassette software.

Database	£19.95 ☐	ZX81 16K Database	£9.95 ☐
Stock Control	£19.95 ☐	BBC Cash Book disk or tape	£95.00 ☐
Mailing List	£19.95 ☐	BBC Disks – other titles	£23.95 ☐
Invoices and Statements	£19.95 ☐	Osborne Disk Database	£23.95 ☐
Commercial Accounts	£19.95 ☐	Word processor	£19.95 ☐
Home Accounts	£19.95 ☐	Beebcalc	£19.95 ☐
		Dragoncalc	£19.95 ☐

Name__________

Address__________

Machine Type__________ Memory Size__________

I enclose__________

Make cheques and postal orders payable to Gemini Marketing Ltd.

Diners Card Number__________ Access Number__________

Signature__________

Gemini. Functional Software Specialists, 9 Salterton Road, Exmouth, Devon.

GEMINI MARKETING LIMITED

Push your Sinclair to the limit

ZX81/SPECTRUM ARCADE GAMES

NEW **ZX INVASION FORCE** (ZX81)
Use your skill to fire through the energy band to destroy the menacing alien ship — **£3.95**

NEW **SPEC INVADERS**
SPEC GOBBLEMAN
These exciting high-speed classic games incorporate hi-resolutiongraphics and sound to bring you the best in arcade action at only **£4.95** each (16/48K)

NEW **SPEC FROG 5/SHOWDOWN** (16/48K)
Hop across the dangerous road avoiding the lethal cars, then lorries. Go back to the wild west for a gunfight battle amongst cacti and wagons. Features include western music. **£4.95**

NEW **NAMTIR RAIDERS** (ZX81)
High speed, quick action arcade game with four separate groups of attackers. **£3.95**

Gobbleman also available for ZX81 at **£3.95**

UTILITIES

NEW **TOOLKIT**
Nine powerful new functions for your ZX81 (including re-number lines (goto, gosub), program merge, string finding and replacement. **£5.95**

SPEC BUG
A 30 in 1 machine code tool and disassembler for your ZX Spectrum. **£6.95**

ZX BUG
A 30 in 1 machine code tool and disassembler for your ZX81. **£6.95**

Improve your machine code programs with this new 48K Spectrum Assembler

Just released by Artic, this new professional quality assembler is also available for 16K ZX81 and features:—

* Word-processor-like text editor. * High-speed, versatile two-pass mnemonic assembler with labels and detailed error-trapping. Will assemble to any address. * Essential support facilities such as memory-edit, register inspect/modify and search for de-bugging. * Full output to ZX-printer. * Memory-status report and comprehensive user-manual. **ONLY £9.95**

ZX81 & SPECTRUM

NEW LOW PRICE ADVENTURE GAMES

ONLY £5.95 for ZX81 and £6.95 for SPECTRUM

INCA CURSE (Adventure B)
In a jungle clearing you come across an ancient Inca temple. Your mission to enter, collect the treasure and escape alive. But beware! Includes a cassette save routine.

SHIP OF DOOM (Adventure C)
You are unavoidably drawn to an alien cruiser. Can you reach the control room and free yourself? Or will they get you first? Includes a cassette save routine.

ESPIONAGE ISLAND (Adventure D)
While on a reconnaisance mission your plane loses control and you are forced to land. Can you survive and escape with the island's hidden secret?

PLANET OF DEATH (Adventure A) 16/48K
You find yourself stranded on an inhabited alien planet. Can you reach your ship and escape?

also available for SPECTRUM

ZX FORTH
Supplied on cassette with editor cassette, user manuals and keyboard overlay. ZX Forth combines the simplicity of basic with the speed of machine code now **£14.95**

THE ULTIMATE ADVENTURE FOR THE SPECTRUM/ZX81 for only £9.95

AND THE CHANCE TO WIN £10,000 or more IF YOU KRAKIT™

RULES AVAILABLE FROM ARTIC

Your eccentric father has left you £10,000 in his will. In order to claim your windfall you must solve twelve clues and gain access to a bank account in which the money has actually been deposited. Be the first to crack the puzzle and the prize is yours! Plus you will win two tickets to the city of the secret KRAKIT™ vault location. The Prize money is increased weekly. A telephone number will be supplied so you have the opportunity to find out just how much you could win.

DON'T MISS YOUR CHANCE TO WIN A FORTUNE!

SPECTRUM MICRO CHESS

The only Chess program for a 16K or 48K Spectrum.
Allows all legal moves, castelling; en-passant and pawn promotion.
Options to play black/or white. Sets board in any position. Full colour and graphics display.

ONLY **£6.95**

new releases for 16K & 48K SPECTRUM

SPECTRUM INVASION FORCE

A popular arcade game for 16K or 48K Spectrum. Fires through the force field to destroy the menacing alien ship. Sounds easy?? Two levels of play — normal or suicidal. Full colour. Sound and hi-res. graphics.

NOW ONLY **£4.95**

A GREAT CHESS GAME FOR YOUR ZX81 OR SPECTRUM*



*SPECTRUM CHESS 48K

ZX CHESS I
Very popular machine code program, with six levels of play and an analysis option. Available for ZX81. **£6.50**

ZX CHESS II
A new improved version, with a faster response time, seven levels of play, analysis option and in addition a recommended move option. **£9.95**

ZX 1K CHESS
An incredible game in 1K for only **£2.95** As featured on ITV

NEW **SPECTRUM VOICE CHESS**
This incredible program talks you through your game.
It tells you its move, recommends a move, and contains a range of facetious comments. The game is based on the highly successful ZX Chess II and is offered at the Christmas offer price of **£9.95.**

SPECTRUM CHESS now only **£9.45**

ALWAYS AHEAD WITH ZX81/SPECTRUM SOFTWARE

Cheques & P.O. made payable to: Artic Computing Limited. Dealer enquiries welcome.
Please state whether your order is for ZX81 or Spectrum. Send S.A.E. (6in × 9in) for catalogue.

ARTIC COMPUTING LTD.
396 JAMES RECKITT AVENUE, HULL, N. HUMBERSIDE,

To: Artic Computing Ltd., 396 James Reckitt Avenue, Hull, N. Humberside, HU8 0JA.

Please supply..
....
....
Cheque for total amount enclosed.
Name...
Address..
....
YC4

TELEWRITER™

the DRAGON 32 Word Processor

TELEWRITER

Telewriter is the powerful word processor designed specifically for the DRAGON 32 Computer. It can handle almost any serious writing job and is extremely easy to use. It has all the advanced features you need to create, edit, store, format and print any kind of text. With Telewriter you can quickly produce perfect, finished copy for letters, reports, term papers, articles, technical documentation, stories, novels, screenplays, newsletters. It is also a flexible and efficient way to take notes or organize ideas and plans.

51 × 24 DISPLAY

The DRAGON 32 is an incredibly powerful and versatile computer, but for text editing it has some major drawbacks. The small 32 character by 16 line screen format shows you too little of the text and, combined with its lack of lower case letters, bears little resemblance to the way text really looks on the page. Reverse video in place of lower case just adds confusion.

Telewriter eliminates these shortcomings with **no hardware modifications required.** By using software alone, Telewriter creates a new character set that has **real lower case letters**, and puts 24 lines of 51 characters on the screen. That's more on-screen characters than Apple II, Atari or TRS-80 Model III. That's more than double the DRAGON 32's standard display.

FULL SCREEN EDITOR

The Telewriter editor is designed for maximum ease of use. The commands are single key (or single key plus control key), fast, and easy to remember. There is no need to switch between insert modes and delete modes and cursor movement modes. You simply type. What you type is inserted into the text at the cursor, on the screen. What you see on the screen is always the current state of your text. You can move quickly through the text with one key cursor movement in all 4 directions, or press the shift key simultaneously for fast, auto-repeat. You can jump to the top or bottom of the text, and beginning or end of a line, move forward or backward a page at a time, or scroll quickly up or down. When you type past the end of the line, the wordwrap feature moves you cleanly to the next.

You can copy, move or delete any size block of text, search repeatedly for any pattern of characters, then instantly delete it or replace it with another. Telewriter gives you a tab key, tells you how much space you have left in memory, and warns you when the buffer is full.

. . . truly a state of the art word processor . . . outstanding in every respect
– The RAINBOW, Jan. 1982

The only one with all these features for your DRAGON 32

51 column × 24 line screen display
Sophisticated full-screen editor
Real lower case characters
Powerful text formatter
Works with any printer
Special MX-80 driver
Requires absolutely no hardware modifications
★ Tandy colour version also available

FORMAT FEATURES

When it comes time to print out the finished manuscript, Telewriter lets you specify: left, right, top, and bottom margins, line spacing and lines per page. These parameters can be set before printing or they can be dynamically modified during printing with simple format codes in text.

Telewriter will automatically number A4 pages (if you want) and centre lines. It can chain print any number of text files from cassette without user intervention. You can tell it to start a new page anywhere in the text or pause at the bottom of the page.

You can print all or any part of the text buffer, abort the printing at any point, and there is a "Typewriter" feature which allows you to type straight to your printer. Because Telewriter lets you output numeric control codes directly (either from the menu or during printing), it works with any printer (Tandy, Seikosha, MX-80, Okidata, NEC 8023, C. Itoh 8510, Centronics, GE Terminet, Smith Corona TP-1, etc.).

There's even a special driver for the Epson MX-80 that lets you simply select any of its 12 fonts and do underlining with a single underline character.

CASSETTE INPUT/OUTPUT

Because the Telewriter makes using cassette almost painless, you can still have a powerful word processor without the major additional cost of a disk. The advanced cassette handler will search in the forward direction till it finds the first valid file, so there's no need to keep retyping a load command when you are lost in your tape. The Verify command checks your cassette save to make sure they're good. You can save all or any part of the text buffer to cassette and you can append pre-existing files from those you have in the buffer already.

ASCII COMPATIBLE

Telewriter turns your DRAGON 32 into the most powerful, lowest cost, word processor in the world today. But that's not all. The simple ASCII conversion program provided with Telewriter means you can use the full power of the Telewriter editor for creating and editing BASIC and assembly language programs. It means you can use Telewriter to prepare or edit text files used with any data communications program.

Telewriter costs £49.95 on cassette and is

AVAILABLE FROM DRAGON 32 DEALERS NATIONWIDE

OR DIRECT FROM

MICRODEAL

41 TRURO ROAD, ST. AUSTELL, CORNWALL PL25 5JE
24 HOUR ORDERLINE 0726 67676

SEND FOR OUR FREE SOFTWARE LISTS FOR DRAGON 32 & TANDY RANGE OF COMPUTERS. PLEASE STATE WHICH COMPUTER YOU OWN

Name ______________________

Address ______________________

____

____

____

Make / type of computer

____

Please include a 1st Class Stamp

. . . one of the best programs for the Color Computer I have seen . . .
– Color Computer News, Jan. 1982

Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc.; TRS-80 is a trademark of Tandy Corp.; MX-80 is a trademark of Epson America, Inc. DRAGON 32 is a trademark of Dragon Data Ltd.

spectrum

NEWS from SPECTRUM

ATARI 800

This **proven and tested** micro is now **UPGRADED to 48K RAM** and there's **no increase in price either** which must make it **about the best value around**. See our ad. for further details.

ATARI 400

Now **REDUCED** by a **MASSIVE £39** to an **incredible price of only £159.95** from **Spectrum.**

SINCLAIR ZX SPECTRUM

We have now added the super **SINCLAIR ZX SPECTRUM** 16K and 48K Models to our range – check our ad. for further details.

NEW SPECTRUM MEMBERS

Check our address page! – there are many new SPECTRUM dealers throughout the UK so there's a good chance there'll be a SPECTRUM centre very near you.

STOCKS

The general stock situation has now improved and you'll find that most **SPECTRUM** centres will be able to supply you **immediately** and at **super LOW prices too!**

INTRODUCING SPECTRUM FACTS!

Next to many of our offers, you'll find a few lines tagged SPECTRUM FACTS. We pride ourselves on providing **you**, the customer, with a **genuine service** as well as super LOW prices, and we want you to know that when you buy from a SPECTRUM dealer, you'll get **exactly the right Micro for your needs. SO LOOK OUT FOR YOUR SPECTRUM FACTS!**

After Sales care

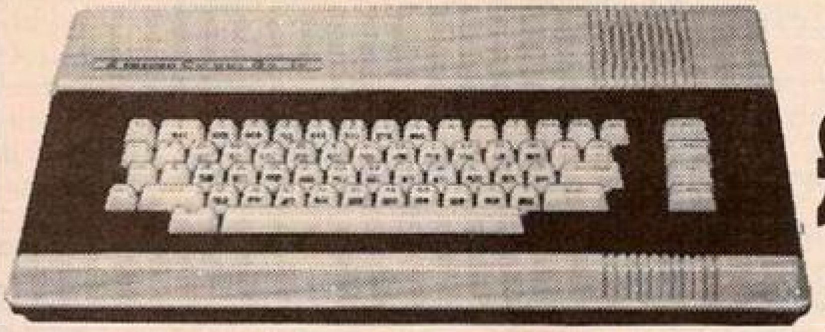
SPECTRUM service centres will ensure that should your machine 'go-down' **we will get it running again as quickly as possible**. We also offer **extended warranties** at reasonable prices too! – ask your **SPECTRUM HOME COMPUTER CENTRE** for full details.

COMPUTER DEALERS!

(or prospective Computer Dealers!) If you would like to know more about becoming a **SPECTRUM APPOINTED DEALER** on an **exclusive area basis**, please write to **MIKE STERN, Spectrum (U.K.) Ltd., Burrowfield, Welwyn Garden City, Herts.**

COLOUR GENIE

A truly reliable micro and highly recommended by Spectrum.



The new **COLOUR GENIE** features powerful and sophisticated **COLOUR GRAPHICS**, allowing you to create full 8-colour Games, Diagrams and Charts quickly and simply.

At its low **SPECTRUM** price, the Colour Genie is amazingly versatile – its **Powerful 16K RAM memory** (expandable internally to 32K) means **FULL COLOUR video games** and **POWERFUL COMPUTING** with a full range of inexpensive accessories: **16K RAM pack, Joysticks** for **TV games, Light Pen, Disk Drive** and a **Printer**.

But that's not all – the Colour Genie also features a **16K ROM Memory** with **128 Upper and Lower case Colour Graphics Charatters** already stored, plus **sound**, a professional **typewriter keyboard**.

In use, it's as straightforward as any, thanks to the use of **BASIC** language and direct keyboard accessed **colour commands**.

The superb Colour Genie is at **SPECTRUM** now – check it out and see the Genius at work!

Spectrum LOW Price £224.48 Inc. VAT

COLOUR GENIE ACCESSORIES

Joysticks	£49.49
16K RAM	£38.50
Printer Interface	£39.95
VISCOUNT Teach yourself Colour Genie BASIC	£6.95

SPECTRUM FACTS

Maximum user RAM	14,200 Bytes (approx)
Text Screen	24 x 40
High Resolution	160 x 96
Cassette Lead	Included

LYNX



Just look at this **super new LYNX Micro** – an **incredible** 16K + 32K video ram and that's **expandable** up to or beyond **96K**. For just **£225.00 INCLUDING VAT** the **LYNX is exceptionally versatile**. All **LYNX's** 'add-on' connections are **standard types**. The **high definition colour graphics** make it a **top-value choice** for the **home or office** (with expansion, the **LYNX** can become an 80 characters-per-line word processor!) Take a look at the **LYNX** – a **memorable bargain** from **SPECTRUM**. But please phone to check stock position **before making a journey** as this new machine is bound to be in **great demand**.

Spectrum LOW Price £225.00

VISCOUNT – Teach yourself LYNX BASIC £6.95

SPECTRUM FACTS

Maximum user RAM	13,700 Bytes (approx)
Text Screen	24 x 40
High Resolution	265 x 248
Cassette Lead	Included

ORIC-1



A superbly designed and engineered micro and great value-for-money from **SPECTRUM**. Offering **48K RAM Colour** – (8 foreground and 8 background can be displayed at same time) **High resolution graphics User definable Graphics. Full sound** (6 octaves of controllable sound.) **Easy to use keyboard** with **moving keys. Standard Centronics parallel interface allows** easy connection to a wide range range of printers etc.

Spectrum LOW Price £169.95 Inc. VAT

SPECTRUM FACTS

Maximum user RAM	47,870 Bytes
Text Screen	28 x 40
High Resolution	240 x 200
Cassette Lead	Included

JUPITER ACE



Outstanding value-for-money! The **JUPITER ACE** uses easy to understand **FORTH** language. **Connects to your own TV. 3K RAM expandable to 19K. Full moving keyboard** with auto repeat and caps lock. **Full sound and chunky graphics.** If you've wanted to learn an impressive Language then this is the machine for you.

Spectrum LOW price £89.95 Inc VAT £76.22 ex vat

SPECTRUM FACTS
Maximum user RAM 1,000 Bytes approx.

Not all stores carry every advertised item, please phone before making a journey – Prices correct at time of going to press E. & O.E.

HURRY! Limited stocks only-

DRAGON



Unbelievable value at only £199.95 from **SPECTRUM!** British built and designed it's one of the **most impressive micros** to appear for quite some time. Extensive facilities include highly advanced colour graphics. Just look at this top specification: Powerful standard 32K RAM (expandable to 64K Bytes). ■ 9 Colour, 5 resolution Display. ■ Extended Microsoft colour BASIC (as standard). ■ Advanced sound with 5 octaves - 255 tones. ■ Professional style editing, e.g. extract line, auto find reinsert. ■ Professional quality keyboard. ■ Centronics Paralled printer interface. ■ Serious programmer/user - the BASIC on this machine is similar to that found on machines costing 3 times the price! ■ Uses almost any cassette recorder. ■ Standard file handling ON TAPE.

Spectrum LOW price £199.95 INC. VAT

SPECTRUM FACTS

Maximum user RAM	29,679 Bytes
Text Screen	16 x 32
High Resolution	256 x 192
Cassette Lead	Included

	EX VAT	INC VAT
ACCESSORIES		
Joysticks (pair)	£17.35	£19.95
Cassette Lead	£2.35	£2.70
CARTRIDGES		
Beserk	£17.35	£19.95
Cosmic Invaders	£17.35	£19.95
Meteroids	£17.35	£19.95
Ghost Attack	£21.70	£24.95
Cave Hunter	£17.35	£19.95
Starship Chamelion	£17.35	£19.95
CASSETTES		
Calixo Island	£6.91	£7.95
Graphic Animator	£6.91	£7.95
Quest	£6.91	£7.95
Madness and the Minotaur	£6.91	£7.95
Examples from Dragon Manual	£6.91	£7.95
Personal Finance	£6.91	£7.95
Dragon Mountain	£6.91	£7.95
Typing Tutor	£6.91	£7.95
Black Sanctum	£6.91	£7.95

VISCOUNT Software for DRAGON Teach yourself Dragon Basic . . £6.95

Now with **48K** RAM and still at the same LOW price!

ATARI 800

Now this proven and tested machine has been upgraded to a massive **48K RAM** and it's still at the amazing **LOW** price of **£399.99** from **SPECTRUM**. It's an ideal Home Micro for graphics, educational and personal finance etc. use and it will take you from learning up to small business use. You can add printers, program recorders, disk drives and more, to expand your micro as and when you want, to suit your needs. So if you're looking for a top-of-the-line micro you must see the **ATARI 800** with **48K** at **SPECTRUM - NOW!**



Spectrum LOW Price £399.99 INC. V.A.T.

SPECTRUM FACTS

Maximum user RAM	37,899 Bytes
Text Screen	24 × 40
High Resolution	320 × 192
Cassette Lead	Needs own Recorder

ATARI 400

16K RAM



NOW ONLY £159.95 INC. VAT

BASIC cartridge extra **£39.99 inc. VAT** (£34.77 ex. VAT)

SPECTRUM FACTS

Maximum user RAM	13,323 Bytes (with basic Cartridge)
Text Screen	24 × 40
High Resolution	320 × 192
Cassette Lead	Needs own Recorder

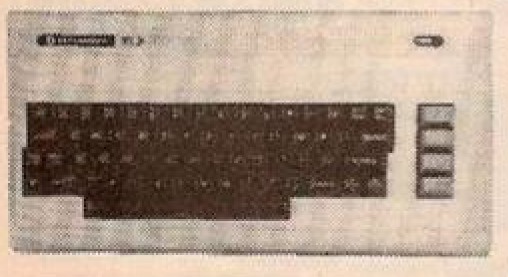
ATARI DISK DRIVE £299.00 INC. VAT

ACCESSORIES, BOOK & GAMES for ATARI

	INC VAT
Accessories	
Thermal Printer	£198.95
16K RAM Pack	£65.00
400 Keyboard	£59.95
32K RAM board (400/800)	£75.00
48K RAM board (400/800)	£99.00
Paddles (Pair)	£13.99
Joysticks (Pair)	£13.99
I/O Cable	£12.99
Printer Cable	£28.50
Monitor Cable	£25.00
Thermal Paper	£4.00
Pointmaster Joysticks	£14.95
Quickshot Joysticks	£14.95
Keyboard for Atari 400	£00.00
Books & Manuals	
Wiley Manual	No VAT
Basic Reference Manual	No VAT
DOS. 2 Manual	No VAT
Operating System Listing	No VAT
DOS. Utilities Listing	No VAT
Home Computer Programs - Home/Office	
Word Processor (Disk)	£99.99
Mortgage & Loan	£14.99
Microsoft Basic (Diskette)	£59.99
Home Study (Cassette except where stated)	
INV. to programming 1	£19.99
INV. to programming 2	£22.99
INV. to programming 3	£22.99
Conversational French	£39.99
Conversational German	£39.99
Conversational Italian	£39.99
Conversational Spanish	£39.99

	INC VAT
European Countries & Caps	£14.99
Hangman	£14.99
Kingdom	£14.99
States & Capitals	£14.99
Touch Typing	£19.99
Music Composer (Cartridge)	£35.99
Home Entertainment (Cartridge except where stated)	
Galaxian	£29.99
Defender	£29.99
Asteroids	£29.99
Basketball	£24.99
Blackjack (Cassette)	£14.99
Caverns of Mars (Disk)	£29.99
Centipede	£29.99
Computer Chess	£24.99
Missile Command	£29.99
PAC Man	£29.99
Space Invaders	£29.99
Star Raiders	£29.99
Cribbage & Domino	£19.95
European Scenic Jig-saw	£19.99
Programming Languages & Aids	
Assembler Editor	£39.99
Atari Basic Cartridge	£39.99
Macro Assembler (Disk)	£59.99
Pilot (Consumer)	£59.99
Pilot (Educator)	£89.99
Entertainer Kit (Star Raiders Missile Command & Pair Joysticks)	£69.99
Programmer Kit (Basic Cartridge & Manuals)	£39.99

Commodore VIC-20



Now a top quality home/business micro for the price of a games machine.
■ Memory expandable to 32K ■ High resolution (full PET type) graphics ■ 16 Screen colours and 8 border colours ■ Plugs in to your TV, or monitor ■ Add Disk Drive & Printer for impressive 170K Byte system ■ Can act as an intelligent terminal for a larger computer.

£129.90 INCLUDING VAT

SPECTRUM FACTS

Maximum user RAM	3,853
Text Screen	22 x 23
High Resolution	176 x 158
Cassette Lead	Needs own Recorder

VISCOUNT SUPER X2

64K DYNAMIC RAM PACK for VIC-20

EXCLUSIVE TO SPECTRUM!

Unbelievable-but-true, now you can up grade your VIC-20 from 3.5K to a massive 67½ RAM. Enables you to load up to 8 games or programs at a time & still select which one you wish to use. Can be used in conjunction with other expansions to increase total memory up to 152K-using the VIC memory expansion board. The SUPER X-2 will make your VIC-20 the biggest little micro in town!

Spectrum LOW price £114.94 INC. VAT

COMMODORE 64

Very limited supplies of this new micro now available - please check with your local SPECTRUM dealer before making a journey.

Spectrum LOW Price £345.00

TEXAS TI99/4A



■ 16K RAM (expandable to 48K) ■ Built-in 14K Byte BASIC interpreter ■ 16 Bit Micro-processor ■ 16 Colour High Resolution graphics ■ Extensive range of solid state software command modules available from games to architectural aids.

Spectrum LOW Price £154.95 INC VAT (£134.74 ex. VAT)

SPECTRUM FACTS

Maximum user RAM	14,500 Bytes (approx.)
Text Screen High Resolution	256 x 192
Cassette Lead	Extra £10.95

	EX. VAT	INC. VAT
TEXAS PERIPHERALS		
Speech Synthesizer	£40.50	£46.58
Peripheral Exp. System	£122.00	£14.30
Disc Cont. Card	£124.30	£142.95
Disc. Drive	£234.74	£269.95
RAM Exp. Card	£179.57	£206.50
Matrix printer	£347.78	£399.95
Software Entertainment		
TI Invaders	£16.48	£18.95
Tombstone City	£19.96	£22.95
Attack	£19.96	£22.95
Parsel	£23.45	£26.96
Car Wars	£23.43	£26.95
Munchman	£23.43	£26.95
Adventure & Pirate	£31.26	£35.95
Education		
Number Magic	£12.13	£13.95
Addition/Subt. 1	£23.43	£26.95
Teach yourself begniners		
BASIC	£8.26	£9.50
Home Budget Management	£19.96	£22.95

. . . and many more

MORE SPECTRUM LOW PRICES ☞

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

spectrum

A few examples from our
Software SELECTION
from independent software houses

THORN EMI

Software for Atari	Inc. VAT
Submarine Commander	£34.44
Jumbo Jet Pilot	£34.44
Soccer	£29.84
Kickback	£29.84
Home Financial Management	£19.49
Darts	£19.49
Snooker & Billiards	£19.49
Pool	£19.49
Cribbage & Dominoes	£14.89
Cupute 4 & Reversi	£14.89
Mutant Herd	£24.25
Software for Commodore.	
River Rescue	£25.24
Vic Music Composer	£25.24
Jungle	£4.49
Cosmic Battle	£4.49
Frogger (3K)	£9.49
Rabbit Functions	£4.49
Code Breaker	£4.49
Night Flight (3K)	£4.49
Rabbit Writer (16K Cassette)	£19.49
Rabbit Base (16K Cassette)	£14.49
Myriad (3K)	£9.49
Charset/20 (3K)	£4.49
Skramble	£9.49
Space Phreeks	£9.49
Night Crawler	£9.49.
Hopper	£9.49
Tank War	£7.49

GEM

Software for ZX81, Dragon and Spectrum	Inc. VAT
Monster Mine (for ZX 81)	£4.95
Monster Mine (for Spectrum)	£4.95
Monster Mine (for Dragon)	£7.95
Space Mission (for ZX 81)	£4.95
Space Mission (for Spectrum)	£4.95
Space Mission (for Dragon)	£7.95
Dragon Golf	£7.95
Dragon Character Generator	£9.95

KUMA

Software for Sharp	
Electron 22622	£9.20
Cribbage	£12.08
Adventure	£12.08
Chess	£16.68

AUDIOGENIC

Programs for VIC-20	Inc. VAT
Amok	£6.95
Alien Blitz	£7.95
Golf	£7.95
Spiders of Mars	£19.95
Sattelite & Meteorites	£19.95
Bonzo	£7.95
Trashman	£19.95
Boss	£14.95
Tank Attack	£19.95
Word Craft Word Processing package	£125.00

SALAMANDER

Games for Dragon 32	Inc. VAT
Dragon Trek	£9.95
Wizard War	£7.95
Vulcan 0/+	£7.95
Games Compendium DI	£7.95
Golf	£7.95

RABBIT

Software for Commodore VIC20	Inc. VAT
Space Storm	£6.49
Ski Run	£4.49
Dune Buggy	£4.49
Super Worm	£4.49

Plus many more at your local SPECTRUM dealer—call in now and see!

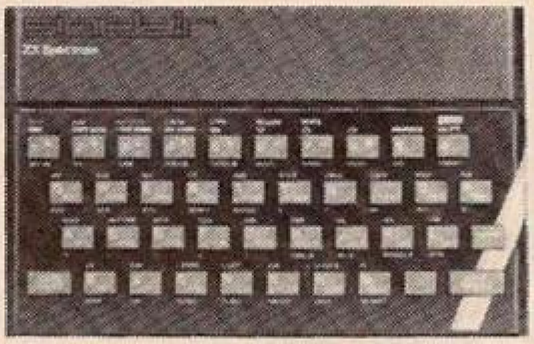
ACCESSORIES



SANYO Colour Monitor
CDD3125N
ONLY
£228.85 inc. VAT
(£199.00 ex. VAT)

SANYO	Inc. VAT
SANYO 12" green monitor	£80.50
Slim 3G Cassette Recorder	£29.95
CTP 3131 14" Colour TV Set	£229.95
C12 Cassettes	£0..50
Single sided, single density disks	£1.95
Double sided, double density disks	£3.38
Disk head cleaner	£16.10
Single part 11" x 9½" printer paper, box of 2,000 sheets	£13.05
VIC-20 Accessories from Viscount	
Motherboard without Buffer	£24.95
Motherboard with Buffer	£29.90
16K RAM Pack	£43.95
32k RAM Pack	£66.95
64K RAM Pack	£114.94
Currah Chatterbox Voice Synthesiser	£57.45

Now available from Spectrum Computer Centres— the top selling:-
SINCLAIR ZX-SPECTRUM



Yes, this top selling micro is now available from your local **SPECTRUM COMPUTER CENTER** in both **16K** and **48K RAM**. So now there's no need to send by mail order, just call into your local **SPECTRUM** dealer and pick one up. But just one word of warning, with this added availability advantage stocks are bound to sell fast – so make it soon!

SINCLAIR ZX SPECTRUM 16K - £125.00
SINCLAIR ZX SPECTRUM 48K - £175.00

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

SINCLAIR ZX-81



SINCLAIR ZX . . . £49.95
16K RAM pack . . £29.95
ZX Printer £59.95

Computer Bookshop Software for Sinclair Computers	INC. VAT
Bumper 7 1K ZX81	£5.95
1K Super Trio ZX81	£7.95
Labyrinth 16K ZX81	£5.95
Nightmare Park/Music 16K ZX81	£6.95
Computacalc 16K ZX81	£7.95
Personal Banking System 16K ZX81	£11.44
Space Invaders/Rescue 16K ZX81	£6.95
Breakout 16K ZX81	£5.95
Mugsy 16K ZX81	£5.95
Mergatroyds 16K ZX81	£5.95
Progmerge 16K ZX81	£5.95
Football Manager 16K ZX81	£7.95
Cassettes for ZX81 Type—10	
6 Games	£3.95
Junior Education	£3.95
Business & Household	£3.95
Skill & Judgement Games	£3.95
Junior Education	£3.95
Family Quiz	£3.95
Type—20	
Fantasy Games	£4.75
Space Raiders & Bombers	£4.75
Type—30	
Super Programs Nos. 1-8	£4.95
Type—40	
Backgammon	£5.95
Flight Simulation	£5.95
Type—50	
English Literature 1	£6.95
English Literature 2	£6.95
Geography	£6.95
History 1	£6.95
Maths. 1	£6.95

Give your ZX81 the power of a big micro!
CHEETAH 64K RAM PACK ONLY £54.95

Quality PRINTERS at super LOW prices from Spectrum

EPSON



Model	INC. VAT
MX80-T3	£378.35
MX80 F/T Type III	£424.35
MX100 Type III	£539.35

Please see your SPECTRUM dealer for prices of INTERFACE/CABLE options.

SEIKOSHA



GP-100A
Now a top quality graphic printer at a price you can afford. Centronics interface connects easily with most micros.
Spectrum LOW price £229.94 Inc. VAT
Cables & Interfaces available for most micros.

SMITH CORONA



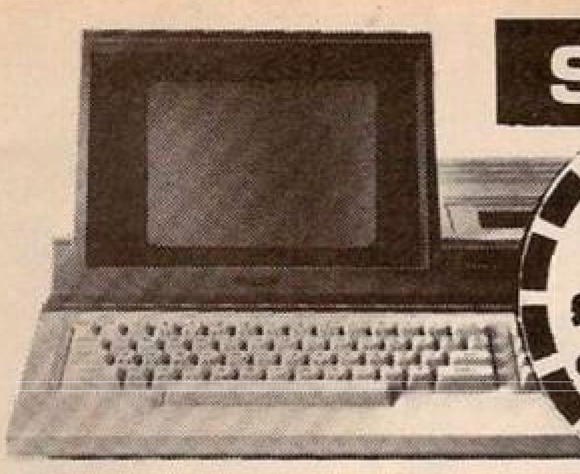
Model TP-1
Microprocessor controlled, high quality daisy wheel printer at a LOW cost from **SPECTRUM**. Serial, Parallel or IEEE Interface.
Spectrum LOW price £557.75 Inc. VAT



BOOKS

SELECTION FROM THE COMPUTER BOOKSHOP	
30 Hour Basic for the B.B.C. Micro	£5.95
Let your B.B.C. Micro Teach You To Programme	£6.45
B.B.C. Micro Revealed	£7.95
Over The Spectrum	£6.95
60 Games and Applications for the Zx Spectrum	£4.95
Programming The 6502	£9.95
Programming Your Zx Spectrum	£6.95
ZAP Pow Boom for the Vic 20	£7.95
The ZX Spectrum Explored	£5.95
Vic Inovative Computing	£6.95
Mastering Machine Code on Your Zx81	£7.50
The Zx Spectrum and how to get the most from it	£5.95
Easy Programming for the ZX Spectrum	£5.95
30 Programmes for tle B.B.C. Micro	£4.95
CPM Handbook	£11.50
Programming the Z80	£11.95
20 Best Programmes for the ZX Spectrum	£5.95
Getting Aquainted with your Vic 20	£6.95
Machine Code and Better Basic	£7.50
The Cambridge Colour Collection (Spectrum)	£6.95
Vic Revealed	£10.00
De RE Atari	£17.00
ATARI Operating system listing	£10.43

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.



SHARP MZ-80A

FREE!
£75 WORTH of software
with every **MZ80A** purchased

Desk top genius! - the all-in-one SHARP MZ-80A. Ready to run the moment you get it home. Built-in keyboard, CRT, 9" display and cassette data storage with **48K RAM**. The BASIC with extra useful additions, offers quite a powerful micro for the home or business ■ 4K Byte ROM · 48K Byte RAM · 2K Byte Video RAM ■ ASCII profiled keyboard · numeric pad ■ 2 page Video RAM allows screen to be scrolled up or down ■ CP/M available.

Floppy Disks and Accessories for MZ80A

Twin Floppy Disk Unit (inc. I/O Card, Disk, Cable)	£856.75
Single Floppy Disk Unit (inc. I/O Card, Disk, Cable)	£460.00
Twin Disk Unit (only)	£678.50
Single Floppy Disk Unit	£480.00
Cable for F/D Drive	£29.79

Printers and Accessories for MZ80A, MZ80B & MZ80K

80 Col Tractor Feed Printer inc. Cable, I/O Card & Rom	£477.25

SPECTRUM FACTS

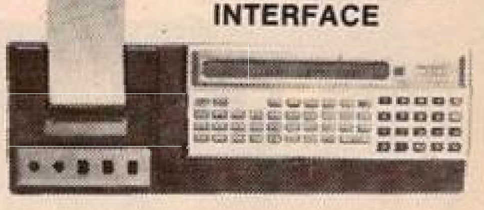
SHARP MZ80A Maximum user RAM 32,000 Bytes (apx.) Text Screen 25 x 40. High Resolution Box 50. Cassette Lead, Cassette Player included.

Spectrum LOW Price £546.25 Inc. VAT

Few only left!

SHARP PC1211

COMPLETE WITH CASSETTE/PRINTER INTERFACE



Ideal for HOME, OFFICE or SCHOOL High performance functions with easy to understand BASIC language.

Unbelievable Value at only £79.95

But HURRY! Stocks strictly limited - first come first served

There's a Spectrum Centre near you . . .

ABERYSTWYTH
AberData at Galloways, 23 Pier St. 0970 615522

ABINGDON
Ivor Fields Computers, 21 Stert St. 0235 21207 (Just Opening)

ACCRINGTON
PV Computers, 38A Water St. 0254 36521/32611 (Just Opening)

ALDERSHOT
David Saunders Computer Centre, 51 Station Rd. 0252 20130 (Just Opening)

ALFRETON
Gordon Harwood, 69/71 High St. 0773 832078

ASHFORD
Ashford Computer Centre, 2 Station Parade, Clarendon Rd. 07842 44955

BANBURY
Computer Plus, 2 Church Lane. (0295) 55890

BARROW-IN-FURNESS
Barrow Computer Centre, 96 Church St. 0229 38353 (Just Opening)

BASILDON
Godfrey's, 28-32 East Walk, Town Centre. 0268 289379

BASINGSTOKE
Fisher's, 2/3 Market Place. 0256 22079

BATH
Software Plus, 12 York St. 0225 61676

BEACONSFIELD
Jameson, 12-14 Warwick Rd. 049-46 4455 (Just Opening)

BEDFORD
Stanad Ltd., 115 Midland Rd. 0234 49341 (Just Opening)

BELFAST
Arthur Hobson Ltd., 37 Great Victoria St. 0232 246336 (Just Opening)

BIRMINGHAM
Sherwoods, Great Western Arcade. 021 236 7211

BOSTON
Fotosound Computers, 19 Dolphin Lane. 0205 64781

BRADFORD
Photosave, 18 Cheapside. 0274 308598

BRIGHTON
Capricorn, 1 Queens Rd. 0273 29634

BURY ST. EDMUNDS
Bury Computer Centre, 11 Guildhall St. (Just Opening)

CAMBERLEY
Camera Arts (Micro Computer Division), 36 High St. (0276) 65848

CAMBRIDGE
KP Ltd., 12a Kings Parade. 0223 68087

CANTERBURY
Kent Micro Systems, Conquest House. 17 Palace St. 0227 50200

CARDIFF
Randall Cox, 18-22 High St. Arcade. 0222 31960

CHELMSFORD
Maxton Hayman Ltd., 5 Broomfield Rd. (0245) 354595

CHESHAM
Reed Photography & Computers, 113 High St. 0494 783373 (Just Opening)

COVENTRY
Coventry Micro Centre, 33 Far Gosford St. (0203) 58942

DARLINGTON
McKenna & Brown, 102 Bondgate. (0325) 59744

DERBY
C T Electronics, at Camera Thorpe, The Spot. 0332 44760

DONCASTER
Briarstar Computer Centre 13 Netherhall Rd. 0302 67135 (Just Opening)

DUMFRIES
Vennals, 71 English St. 0387 4547

DUNSTABLE
Dormans, 7-11 Broad Walk. 0582 65515

EDGWARE
Breaker 1-4, 130 High Street. 01-952 7488/8860 (Just Opening)

EDINBURGH
The Silicon Centre, 6-7 Antigua St. 031 557 4546

GLASGOW
Victor Morris Ltd., 340 Argyle St. 041 221 8958

GLOUCESTER
The Model Shop, 79-81 Northgate St. (0452) 410693

GRIMSBY
R. C. Johnson Ltd., 22 Friargate, Riverhead Centre. 0472 42031

GUERNSEY
Grut's, 3-5 The Pollet, St Peters Port. 0481 24682 (Just Opening)

GUILDFORD
The Model Shop, 23 Swan Lane. (07072) 0483 39115

HARROW
Camera Arts (Micro Computer Division), 24 St. Ann's Rd. 01-427 5469

HATFIELD
Microworld, 2 Crawford Rd. (07072) 64137

HITCHIN
Camera Arts (Micro Computer Division), 68A Hermitage Rd. 0462 59285

HULL
The Computer Centre (Humberside) Ltd., 26 Anlaby St. (0482) 26297

ILFORD
Prot Enterprises, 1 Centreway, High Rd. 01-553 0144 (Just Opening)

IPSWICH
Brainwave, 24 Crown St. 0473 50965

JERSEY
Audio & Computer Centre 7 Peter St., St. Helier 0534 74000

KILMARNOCK
Vennals, 49 Foregate 0568 32175

LEEDS
Bass & Bligh, 4 Lower Briggate. 0532 454451

LEICESTER
Youngs, 40-42 Belvoir St. 0533 544774

LITTLEHAMPTON
Alan Chase Ltd., 39 High St. 09064 5674/4545 (Just Opening)

LIVERPOOL (Aintree)
Hargreaves, 31/37 Warbreck Moor. 051-525 1782 (Just Opening)

LONDON E8
McGowans, 244 Graham Rd. Hackney. 01-533 0935 (Just Opening)

LONDON EC2
Devron Computer Centre, 155 Moorgate. 01-638 3339/1830

LONDON SE1
Vic Odden's, 6 London Bdg. Walk 01-407 6833 403 1988 (Mail Order)

LONDON SE9
Square Deal, 375 Footscray Rd., New Eltham. 01-859 1516

LONDON SE15
Castlehurst Ltd., 152 Rye Lane, Peckham. 01-639 2205

LONDON SW6
Chelsea Micros Ltd., 14 Jerden Place. 01-385 8494 (Just Opening)

LONDON N1
ASP Micro Systems, 185 Upper St., Islington. 01-359 9095

LONDON N.20
Castlehurst Ltd., 1291 High Rd. 01-446 2280

LONDON NW9
Moviescope, 459 Kingsbury Rd., London NW9. 01-204 6352 (Just Opening)

LONDON W1
Devron, 4 Edgware Road. 01-724 2373

LONDON W1
Computers of Wigmore Street, 87 Wigmore St. 01-486 0373 (Just Opening)

LONDON W3
Colormatic Computers, 44 High St., Acton. 01-992 7611

LONDON W11
Electroleisure, 120 Notting Hill Gate. 01-221 7029

LOUGHTON
Micro & Movie Channel 309 High Rd. 01-508 1216

LOWESTOFT
John Wells, 44 London Rd. North. 0502 3742 (Just Opening)

LUTON
Terry-More, 49 George St., 0582 23391/2

MACCLESFIELD
Camera & Computer Centre, 118 Mill St. 0625 27468

MANCHESTER
Lomax Ltd., 8 Exchange St., St. Ann's Sq. 061 832 6167

MANCHESTER GTR.
Mr. Micro Ltd., 69 Partington Lane, Swinton. 061 7282282 open Thurs.-Fri.-Sat. till 8 p.m.

MANCHESTER GTR.
PASE, 213-215 Market St., Hyde. 061-366 5935 Telex: 665845

MANCHESTER GTR.
Wilding Ltd., 23 Deansgate, Bolton. 0204 33512

MIDDLESBROUGH
McKenna & Brown, 190 Linthorpe Rd. 0642 248345

NEWCASTLE-ON-TYNE
Newcastle Camera & Computer Mart, 16 Northumberland Ct. 0632 327461

NEW MALDEN
Surrey Micro Systems, 31 High St. 01-942 0478

NEWPORT (Gwent)
Randall Cox, 118 Commercial St. 0633 67378

NORTHAMPTON
Basic Computers & Systems Ltd., 72 Kingsthorpe Hollow. 0604 710740

NORTHWICH
Camera & Computer Centre, 3 Town Sq. (0606) 45629

NORWICH
Sound Marketing, 52 St Benedicts St. 0603 667725 (Just Opening)

NOTTINGHAM
Cameo Computers, 8/9/10 Trinity Walk. 0602 42912

NOTTINGHAM
Basic 39-41 Trent Boulevard, West Bridgeford 0602 819713

OLDHAM
Home & Business Computers Ltd., 54 Yorkshire St., 061-633 1608

PAIGNTON
Devon Computers, 81 Upper Manor Rd. (0803) 526303

PEMBROKE
Randall Cox, 19 Main St., 064 668 2876

PETERBOROUGH
Peterborough Communications 91 Midland Rd. 0733 41007

PETERHEAD
DIMES Electronic Services, 1-3 Ellis St. 0779 79900 (Just Opening)

PRESTON
Wilding's, 49 Fishergate. 0772 556250

READING
David Saunders Computer Centre, 8 Yield Hall Plce. 0734 580719

ROTHERHAM
Kenneth Whitehead, 2 Market St. 0709 62594 (Just Opening)

RUGBY
The Rugby Micro Centre, 9-11 Regent St. 0788 70522

SEVENOAKS
Ernest Fielder Computers, Dorset St. 0732 456800 (Just Opening)

SHEFFIELD
Superior Systems Ltd., 178 West St. 0742 755005

SOUTHAMPTON
R. J. Parker & Son Ltd., 11 Portsmouth Rd., Woolston, Southampton. 0703 434137/8 (Just Opening)

SOUTHPORT
Central Computers, 575 Lord St. 0704 31881 (Just Opening)

STAFFORD
Computerama, 59 Forgate St. (0785) 41899

STEVENAGE
D. J. Computers 11 Town Sq. 0438 65501

STOCKPORT
Wilding Ltd., 1 Little Underbank, Stockport. 061-480 3435

STOKE-ON-TRENT
Computerama, 11 Market Sq. Arcade, Hanley. (Opening Soon)

ST. ALBANS (Herts)
Clarks Computer Centre, 14-16 Holywell Hill. 0727 52991

ST. AUSTELL
A B & C Computers, 11 Brookstone Rd. (0726) 64463

TAUNTON
Grays, 1 St James St. 0823 72986 (Just Opening)

TEDDINGTON
"Andrews", 49 Broad St. 01-977 4716

WALLINGTON
Surrey Micro Systems Ltd., 53 Woodcote Rd. 01-647 5636

WARRINGTON
Wildings, 111 Bridge St. 0925 38290

WATFORD
SRS Microsystems Ltd., 94 The Parade, High St. 0923 26602

WEST BROMWICH
Bell & Jones, 39 Queens Sq. 021 553 0820

WHITEHAVEN
P. D. Hendren, 15 King St. 0946 2063 (Just Opening)

WIDNES
Computer City, 78 Victoria Rd. 051 420 3333

WIGAN
Wilding Ltd., 11 Mesnes St. 0942 44382

WOKING
Harpers, 71-73 Commercial Way. 04862 61061

WORCESTER
David Waring Ltd., 1 Marmion House, High St. 0905 27551

GT. YARMOUTH
Tony Hood Electronic, 26A Market Gate Shopping Centre 0493 3143

YORK
York Computer Centre, 7 Stonegate Arcade. 0904 641862

Opening soon in: Liverpool, Bristol, Hereford, Weston-Super-Mare, Portsmouth, Bury, Crewe, Borehamwood, Colchester, Bromley

Not all stores carry every advertised item, please phone before making a journey — Prices correct at time of going to press E. & O.E.

Make much more of your computer!

More memory for your ZX81!

ZX-PANDA.

The uniquely expandable 16K RAM pack



The professionally produced 16K RAM Pack that is expandable to 32K simply by plugging-in our expansion module.
Start with 16K . . . expand later to 32K!
Solidly built, attractively cased to fit perfectly on to a ZX81 without wobble!
Includes LED power indicator.
The RAM pack that won't become redundant when you want more than 16K!

16K Expandable RAM. **£32.95**
16K Expansion Module **£19.95**

More sound from your ZX Spectrum!

Echo



Not only more sound, but better sound and a wide range of other facilities!
Control Volume, and adjust tone of sound!
Load and Save without switching leads!
Audible cue facility for tape programs!
DIN compatibility!
No additional power supply needed!
Attractively cased – looks good – SOUNDS GOOD!

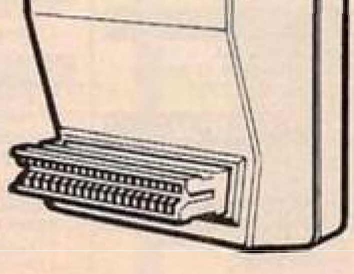
Only £23.50

More memory for your Jupiter Ace

Pacer

New

The uniquely expandable 16K RAM pack



Similar concept to ZX-PANDA but for the incredible Jupiter Ace.
Attractive, solidly built 16K RAM pack with the facility of expanding to 32K by plug-in module.
For more power to faster FORTH . . . you need a PACER!

16K Expandable RAM **£29.95**
16K Expansion Module. **£19.95**

More memory for your VIC-20

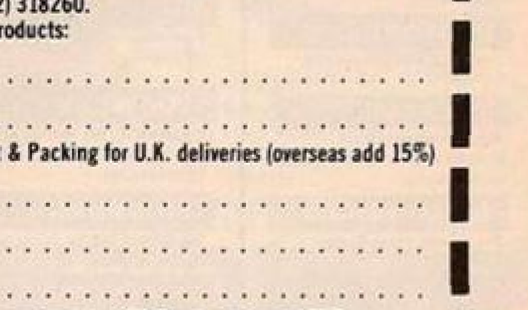
Vixen RAM Cartridge for the VIC-20



Switchable between 16K or 8K + 3K.
Gives you the option of full 16K RAM or 8K and 3K RAM in one package. When added to a Standard VIC-20 gives 16384 bytes of extra memory in memory blocks 1 and 2 or 3092 bytes of extra memory into the 3K memory block AND 8192 bytes of extra memory switchable between memory blocks 1 and 3.
Fully compatible with available motherboards/modules.
Simply plugs into the rear expansion port of computer.
No re-addressing of existing BASIC programs needed. **Only £44.95**

Tandem

Expandable Expansion System for the VIC-20



Gives 4 expansion slots for VIC-20 cartridges.
Custom-designed case. Plugs directly into computer. Further expanded by using TANDEM System!
ROM socket for expansion.
No extra power supply needed.

Only £34.95

To: Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants. Telephone: (0252) 318260.
Please forward me the following products:

. . . .

. . . .

All prices are inclusive of VAT, Post & Packing for U.K. deliveries (overseas add 15%)

Name: . . . .

Address: . . . .

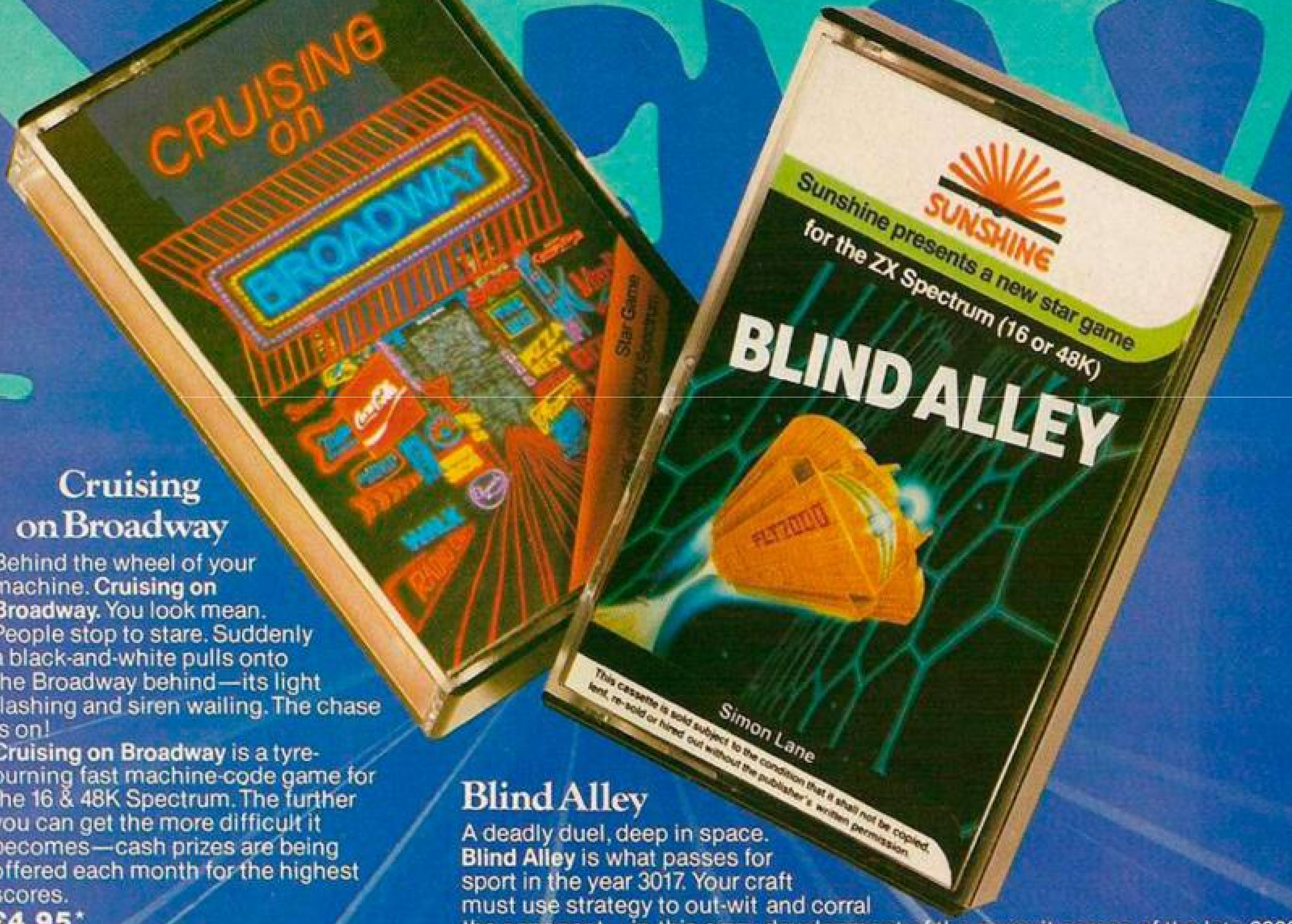
. . . .

STONECHIP ELECTRONICS

"more ways to make more of your computer"

Y

DEALER ENQUIRIES WELCOME Delivery approx 14 days



NEW

Cruising on Broadway

Behind the wheel of your machine. **Cruising on Broadway.** You look mean. People stop to stare. Suddenly a black-and-white pulls onto the Broadway behind—its light flashing and siren wailing. The chase is on!

Cruising on Broadway is a tyre-burning fast machine-code game for the 16 & 48K Spectrum. The further you can get the more difficult it becomes—cash prizes are being offered each month for the highest scores.

£4.95*

Blind Alley

A deadly duel, deep in space. **Blind Alley** is what passes for sport in the year 3017. Your craft must use strategy to out-wit and corral the opponent—in this crazy development of the pursuit games of the late 2600s. After each round in the enclosure game more players are sent against you to test your skill and agility. **Blind Alley** is the machine-code action of the future—now! For the 16 & 48K Spectrum.

£4.95

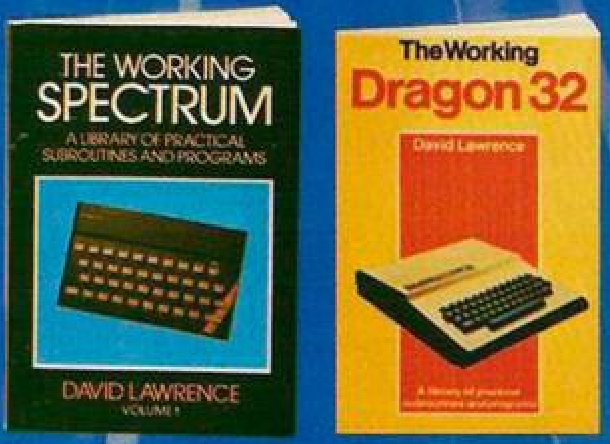
2 cassettes & 2 books from Sunshine

The Working Spectrum

(228 page book)

The first well-documented collection of serious programs for the ZX Spectrum. Programs include a Basic Renumber which can handle Gotos and Gosubs, a character dictionary, a file-handler, several utility programs and a few games. Each program is built up out of re-usable subroutines.

£5.95*



The Working Dragon 32

This is a companion volume to The Working Spectrum and includes several new features such as a Text Editor and a Music Composer and Editor. Other programs help you use the Dragon 32 as an accountant, for more advanced high resolution graphics, as a home tutor for education and for playing games. Each of the programs and subroutines is explained line by line to help develop your own programming skills.

£5.95*

***Submit *your* program to Sunshine and your name could be here next month.**

SUNSHINE

*Available through W. H. Smith's and computer dealers.

Trade/dealer enquiries welcome.

Please send me

- ☐ **The Working Spectrum** at £5.95 each
- ☐ **Cruising on Broadway** at £4.95 each
- ☐ **The Working Dragon 32** at £5.95 each
- ☐ **Blind Alley** at £4.95 each

I enclose a cheque/ postal order for £________

payable to **Sunshine Books**
19 Whitcomb Street, London WC2 7HF.

Name ________________

Address ________________

Signed ________________

We can normally deliver in four to five days.



THE
imagine
INVASION
HAS
BEGUN
The assault on your senses has begun with a great choice of games that have been created to give you a real challenge!
ARCADIA
SCHIZOIDS
imagine
..the name of the game



meanest,
he
er wave of the most
ns
rds your space
ent.
dual Plasma Disruptors and
ve haven't you?
TRUM (16K or 48K)
machine code with 12 different alien types,
ible animation and explosive effects, sound and the
est, smoothest hi-res graphics ever!
VIC-20 (any memory size)
100% machine code with eight different alien types,
smooth hi-res multicolour graphics and animation, narrow
playfield and sensational sound effects.
Keyboard or joystick.
Game design and software by D. H. Lawson.
for any ZX SPECTRUM.
It's my own fault, I even volunteered.
I thought that with the space-dozer and its shovel and skyhook
it would be easy shifting the galaxy's rubbish.
Childs play. HUH! They warned me of the weird packaging,
the trays, the rods, and all the rest.
But they didn't say I'd have to stop and control not just one but two
or even more garbage pods. Then prod them, push
them, toward that black hole, and oh, it's so very, very
black, and so lonely, so empty.
Panic, mustn't panic, but they won't stop, twirling and
spinning and turning, always turning, towards me, against
me, at me. And I'm alone.
No way out, nowhere to hide, on my own, my own... own....
SCHIZOIDS. NOT JUST A GAME. BUT A STATE OF MIND.
SCHIZOIDS features real-time animated 3d graphics for a
breathtaking visual experience, plus sound and all those arcade
features you'd expect from IMAGINE.
Game design and Software by Peter Paranoid and
the Yid Kids. (D.H.L.)
Wacky Waiters
the wildest, zaniest way of earning a
fast buck. With crazy guests screaming for
service you're gonna have to be
quick to pick up the tips, don't slop the drinks,
as you dodge the drunks and
dart from elevator to elevator, coz if the Boss
man spots you, your gonna be
out on your but. 100% machine code,
incredible animation, super smooth hi-res
multicolour graphics, authentic
sound effects and special playfield.
Keyboard or joystick control.
Yet another high performance
Arcade quality experience
for any Commodore
Vic-20.
Game design and
software by
Eugene Evans.
WACKY
WAITERS



WATCH OUT FOR THEM...
Barney
bootlace
had never had
it so bad, demoted
from ace detective of
the aristocracy to the
level of a mere store
detective he wanders his
now well worn beat around the
jewellery and watch counters
considering his
life for the hardened
he has to look after
valuable umbrellas
lost property
expect the
or a planted
Catcha Snatcha
imagine
..the name of the game


hectic
when
and return
handbags to the
of course one can
bungling shoplifters
to add to the fun and
SNATCHA brings to your
the mad, mad world of the
detective in what has to be the most
super store ever built with hordes
of harassed housewives doing their
weekly shopping. And you just wait till
the late-night shopping starts.
CATCHA SNATCHA features smooth
Hi-Res multicoloured graphics, sound,
multiple playfields and a real time clock.
100% machine code. Keyboard or
joystick.
Game design and software by
Eugene Evans.
for any Commodore Vic-20.
Ah diddums
for any ZX SPECTRUM.
Are you just the average teddy.
Are you teddy enough to
take on the terrors of the
toybox in an epic struggle to fulfill your
true role in life – to reach and comfort your
crying baby? To boldly go where no teddy
has gone before. To overcome incredible
odds, to take on and fight the clockwork
soldiers, the mammah dolls, the train set, the
play people, and the murderous plastercine.
With only the bear essentials – your
wellington boot, your beachball and faithful
old peashooter – for your defence and your
only ally the Jack in the Box, you will need
to build stairways from the play bricks
around you to reach your baby without
getting the stuffing knocked out of you.
AH DIDDUMS features multiple
toyboxes with progressive difficulty
levels, super cute – super detailed
animation, sound and those fast
smooth graphics that only
IMAGINE can produce.
100% machine code.
Game design
and software by
D. H. Lawson.

THERE IS NO ESCAPE

FRANTIC
for any VIC-20
MISSION: To
excavate and mine the
many moons of Spectum.
To research and destroy the
many alien life forms present.
METHOD: GEO-GRAVITATIONAL
MINING.
Your visor shows a visually break
view, a near blurr of speed as
towards the centre of the m
pulled through by the dr
with only a standard
withhold the pull.
The above video
mere TV mess
which you
formidab
the hu
for
A



Any of these games for just

£5.50 EACH

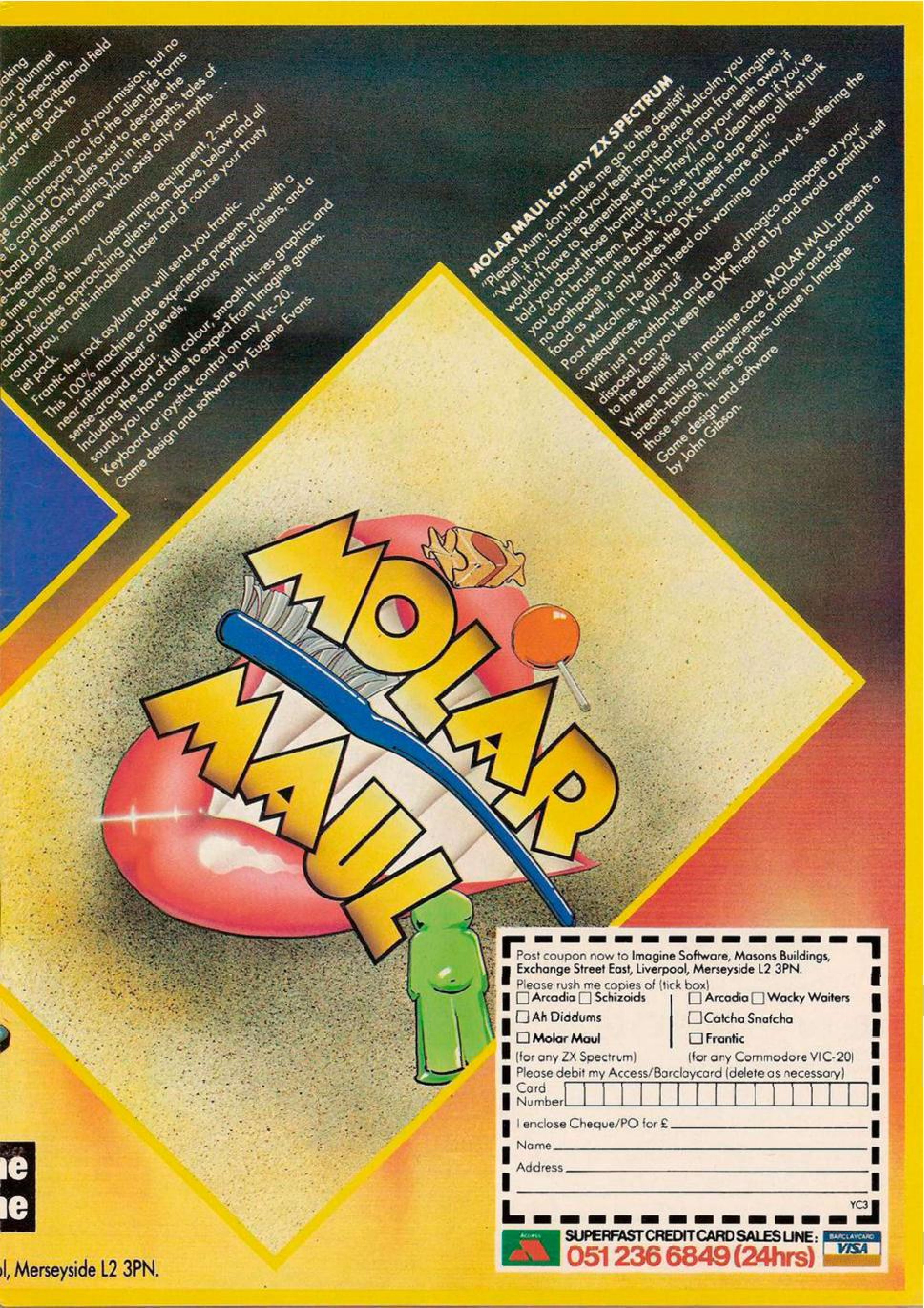
including first class post, packing, VAT and an UNCONDITIONAL LIFETIME GUARANTEE

When you buy Imagine Software you buy it for life. If an Imagine Software product EVER fails to load first time simply return it to Imagine for an instant free replacement.
All orders despatched by first class post within 24 hours of receipt. Subject to stock availability.
Why not put a first class stamp on your envelope and you will receive your order within 3 days of posting. Available from W.H. Smiths, Boots, Laskys and all good software outlets.

Imagine ..the nam of the gam

Dealership enquiries contact: Mark Butler

Imagine Software, Masons Buildings, Exchange Street East, Liverpo

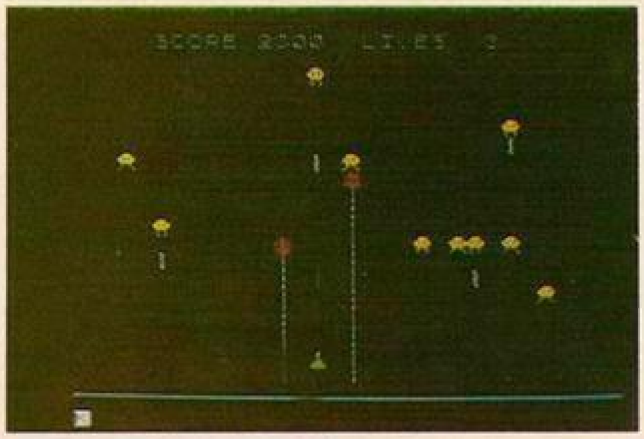


acking
our plummet
ons of spectrum,
w of the gravitational field
i-grav jet pack to
gram informed you of your mission, but no
ge could prepare you for the alien life forms
e to combat Only tales exist to describe the
band of aliens awaiting you in the depths, tales of
e-beast and many more which exist only as myths . . .
e time being?
hand you have the very latest mining equipment, 2-way
radar indicates approaching aliens from above, below and all
round you, an anti-inhabitant laser and of course your trusty
jet pack.
Frantic the rock asylum that will send you frantic.
This 100% machine code experience presents you with a
near infinite number of levels, various mythical aliens, and a
sense-around radar.
Including the sort of full colour, smooth Hi-res graphics and
sound, you have come to expect from Imagine games.
Keyboard or joystick control on any Vic-20.
Game design and software by Eugene Evans.
MOLAR MAUL for any ZX SPECTRUM
"Please Mum, don't make me go to the dentist!"
"Well, if you brushed your teeth more often Malcolm, you
wouldn't have to. Remember what that nice man from Imagine
told you about those horrible DK's. They'll rot your teeth away if
you don't brush them. And it's no use trying to clean them if you've
no toothpaste on the brush. You had better stop eating all that junk
food as well, it only makes the DK's even more evil."
Poor Malcolm. He didn't heed our warning and now he's suffering the
consequences. Will you?
With just a toothbrush and a tube of Imagico toothpaste at your
disposal, can you keep the DK threat at by and avoid a painful visit
to the dentist?
Written entirely in machine code, MOLAR MAUL presents a
breath-taking oral experience of colour and sound and
those smooth, hi-res graphics unique to Imagine.
Game design and software
by John Gibson.
MOLAR MAUL
Post coupon now to Imagine Software, Masons Buildings,
Exchange Street East, Liverpool, Merseyside L2 3PN.
Please rush me copies of (tick box)
☐ Arcadia ☐ Schizoids
☐ Ah Diddums
☐ Molar Maul
(for any ZX Spectrum)
☐ Arcadia ☐ Wacky Waiters
☐ Catcha Snatcha
☐ Frantic
(for any Commodore VIC-20)
Please debit my Access/Barclaycard (delete as necessary)
Card Number
I enclose Cheque/PO for £
Name
Address
YC3
Access
SUPERFAST CREDIT CARD SALES LINE:
051 236 6849 (24hrs)
BARCLAYCARD
VISA
ne
ne
l, Merseyside L2 3PN.

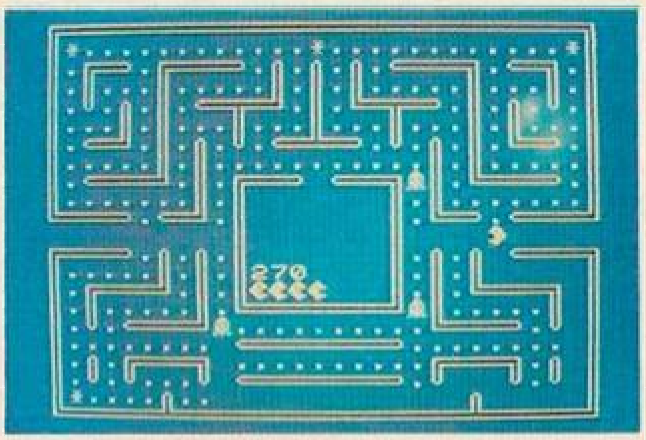
THIS IS THE AGE OF

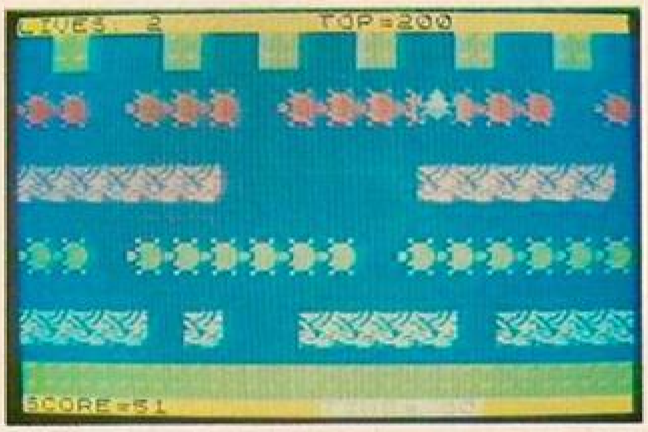
C☆TECH

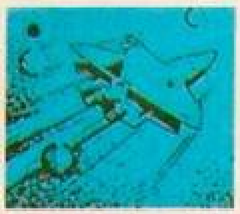
HOME COMPUTING



ZX Spectrum SOFTWARE







GORFIAN

GORFIAN INVADERS, A Superb 4 screen machine code program with Invaders, Galaxians, Firebird and Flagship. Multicoloured Hi-Resolution graphics and Sound Effects.
For the 48K Spectrum, price £5.00

KRAZY KONG



KRAZY KONG, Another 100% machine code program, featuring 3 Screens of Hi-Res Gorilla, Barrels, Fireballs, Lifts and a Running and Jumping man who must rescue his girlfriend from the enraged KONG! For the Spectrum, price £5.00



SPECMAN & FROGGER



FROGGER AND SPECMAN, two excellent games for the price of one! SPECMAN is probably the best version of it's type with great machine code graphics and sound effects with 3 to 5 ghosts, power pills and a real munchie man who munches away in all directions unlike cheaper versions!
Frogger, is a 2 screen superb representation of this arcade classic and has full colour Hi-Res Frogs, Cars, Roads, Logs, Turtles and Riverbank. Plus Super sound effects.
Both on one cassette for the Spectrum, price £5.00.

CENTIPEDE

CENTIPEDE AND PAINTER
By the time you read this our latest release for the Spectrum should be available . . . .
Centipede is a full colour machine code arcade game where the object is to defend yourself with your Laser against a fast moving centipede which weeves in and out of the mushroom patch. There are other versions of this game but we think you'll prefer ours because we always strive for an extra dimension of realism, which makes all the difference!
Painter, is another well loved Arcade game here you must paint in between the numbers on a multicoloured screen before you have to overlap.
Price for SPECTRUM is £5.00.

HOW AND WHERE TO GET C☆Tech Software PRODUCTS
There are three ways to get the tape that you require, firstly you can go to one of around fifty retailers in the UK and some more overseas, there is at least one in every town and several in major cities.
Secondly you can ring our Telesales on 061-366 8223 and Alison or Shirley will take your order and tell you of any other games you might be interested in.
Last the most popular way is to simply clip the coupon and send it to us at:
C☆Tech, 184 Market St, HYDE, CHESHIRE, SK14 1EX.

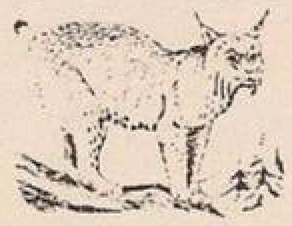
PLEASE SEND ME THE FOLLOWING: ....

MY NAME AND ADDRESS IS ....

Postcode ....

I ENCLOSE .... £ ....

ATTENTION ALL "LYNX" OWNERS!



ACTIVE SOFTWARE announce the PURR.R.. fect solution to your LYNX's ill supplied appetite!!

OUR POLICY IS **100%** CUSTOMER SATISFACTION — **TRY US!**

2 FULL LENGTH, ENTERTAINING PROGRAMS ON ONE CASSETTE — EACH PROGRAM INCORPORATING THE IMPRESSIVE COLOURS AND THE SUPERB HIGH RESOLUTION GRAPHICS OF THE **LYNX**

FRUIT MACHINE A computer simulation of the popular electronic "One Armed Bandit", featuring 'HOLD', 'NUDGE' and 'GAMBLE', etc. Excellent use of high resolution graphics and colour allows a very realistic representation of the standard symbols. Just like the real thing!

EXECUTION Enjoy hours of entertainment with this hangman type game of a difference. Already a firm favourite with many of our existing customers.

FREE CHARACTER GENERATOR AID! Save yourself hours of painstaking coding and drawing with our easy to use program.

* All 3 programs supplied for the realistic price of just:— **£5.75** + 25p p+p
* All 3 programs double recorded on our own quality cassette tape.
* 48 Hour Dispatch From Receipt Of Order!!

Send Cheque/P.O. to: Active Software, 117 Icknield St, B'ham. B18 6RZ

PROGRAMS for the DRAGON

MONSTER MINE by W. E. MacGowan.
Escape from the mine with as much money as you can but don't get closed in or caught by the prowling monsters. An addictive machine code game, with superb graphics and save facility.......£7.97.

SPACE MISSION by W. E. MacGowan.
launch from lunar base, fight your way through the meteor storm and battle with the alien fleet in deep space. Multiple skill levels and the best graphics ever..........£7.95.

GOLF by Pete Allen.
Over 20K of Basic, giving you full 18 hole golf course with handicaps choice of clubs, golfing weakness must be specified, full colour and sound including score card....£7.95.

GAMES PACK I
Space Wars by John Line. Torpedo by Erik Pattison. Sheepdog By Erik Pattison. Snake by Christopher Hunt.

GAMES PACK II
Landing by Peter Chase. Hangman by Christopher Hunt. Speedboat by Peter Chase. Battleships by C. A. Castle.

GAMES PACK III
Reversi by Dr. R. J. Fryer.
Try to beat the Dragon at this fascinating board game. From Novice to Grand Master.
Pontoon by Christoper Hunt.
Play this favourite card game with the Dragon as the banker. Incredible graphics and sound .£7.95.

ALIEN BLITZ by Peter Chase.
Your craft is running low on fuel and you must land! You have to use your bombs to clear a space amongst the skyscrapers, but beware of craters! A superb multi-level action game, with superb sound and graphics.......£7.95.

GEMPACK IV by W. E. MacGowan.
Two great machine code games with full colour graphics. In Sea Harrier you must land on the aircraft carrier after dispersing the clouds. In Sub Chase you must depth charge the wolf pack without being sunk. Both with 4 levels of skill from easy to kamikaze.......£7.95.

CHARACTER GENERATOR by John Line.
Create and use your own symbols and character sets on the Dragon's high resolution graphics screens. Written in Basic for ease of use. Comes with complete ASCII character file and demonstration program.......£9.95

EDUQUIZ I by Peter Chase.
Three great Educational Quiz games. Bet on the answers of your choice and be a winner!' Eduquiz makes learning fun! On this tape, improve your knowledge cf Geography, Inventors and their inventions and the Kings and Queens of Great Britain........£9.95.

ALL THE ABOVE CASSETTES AVAILABLE MAIL ORDER THROUGH

GEM SOFTWARE

22 Prestwick Drive, Bishop's Stortford, Herts, CM23 5ES.
Telephone: 0279 52401

TRADE ENQUIRIES WELCOME.

SPECTRUM OWNERS!

SOFTWARE FOR A 16K OR 48K ZX-SPECTRUM

3D MAZE OF GOLD.......£5.95
Uses machine code to provide fast, full colour 3D perspective views as you scour the labyrinth for GOLD. Look lively and find the exit or your gold may well be worthless! Ten levels of play all great fun. This is our most popular program.

GAMES TAPE 1.......£4.95

MONGOOSE
Fast m/c action, in colour as you try to save your snake from the voracious Mongoose, don't dare pause! Your snake grows by eating the falling apples in the orchard. Faster and harder on every frame, superb graphics.

BEAR ISLAND
Trapped in the Arctic, can you survive when each ice flow has even more bears than the last? A fast arcade style, strategy game. Making full use of all the Spectrum features it is highly exciting and much acclaimed by all.

GAMES TAPE 2.......£4.95

REVERSI
This game provides a chance to pit your strategic abilities against those of the computer or another player. The version provides machine code thinking speed and plays a good game. Includes audible and visual indication of moves made.

POKER DICE
Gamblers beware! The use of hi-res graphics, colour and sound together with a clever 'hand' recognition system, makes this an addictive gamling game. You could win a fortune, you might lose your shirt, but roll, roll, roll those dice.

GAMES TAPE 3.......£4.95

TIME-LINK
A feat on the 16K machine as it provides a full textual type adventure with a maze. Written in 100% m/c for speed. You must find your time machine to return to the present, beware the gas!

TASKS
A new concept in graphical adventures. Collect all the treasure from within the maze by solving all the problems set by the TASK-MASTER. All the tasks given will stimulate your mind.

WHITE NOISE & GRAPHICS.......£5.95
Designed to overcome the limitations of Spectrum BASIC, WNG gives you over 20 extra commands to give; explosion sound effects, total screen control using a window which can be scrolled in any direction cleared, inverted, shaded and bordered. Uses BASIC variables (no POKEs needed), and named USR calls. Includes extensive manual.

CESIL.......£5.95
A low cost, full implementation of this popular 'O' level teaching language, invaluable to students and teachers alike. Includes a comprehensive manual, tape load and save, editing etc. It is available for the SPECTRUM, 16K ZX81 and now for the DRAGON 32.

GILSOFT
30 Hawthorn Road
Barry, S.Glam. CF6 8LE

S.A.E. for full details of these and other items.
RETAILERS INCLUDE: CARDIFF, Microcentre, Randall Cox; BARRY, Bytewell; YORK, Garnett Computer Services; BRIGHTON, Gamer; MORLEY, Dragonbyte; IVYBRIDGE, Ivysoft; PORT TALBOT, Jay Dee Communications. Also by mail from The Software Supermarket, LONDON.

DEALER ENQUIRIES ARE WELCOME. GENEROUS TRADE DISCOUNTS ARE AVAILABLE

THE CASTLE OF RIDDLES

At last the task is finished — Castle of Riddles is solved! Although it undoubtedly took me longer than many others, I posted my competition form earlier this morning. I also felt the need to make a few comments.

I am not an adventure game expert by any means, Castle of Riddles was the first I have ever completed, but what a marvellous five days' enjoyment I have had. A thoroughly well-planned and written program with only one exception which I will come to in a moment.

I would never have believed the incredible emotional ups and downs a game like that could produce. From Saturday morning to evening, passing the Shooting Gallery or the Awesome Creature was proving absolutely impossible. That was a low low. My wife encouraged me to take a break and relax. A few hours later the thought of exploding the case and scaring the Giants seemed a possibility. Sure enough that was a high. Later in bed, amid a turmoil of thoughts, the association between the red paint and the creature occurred.

On Sunday morning with trembling fingers, I threw the can of paint and observed with undisguised joy the dying of the beast. That was a high high.

The one odd thing about the program was the Black Rod. I just could not believe that losing the rod before moving through the Black Passage was correct. I tried for a long time making the trip from the Pit through the tunnel the final move, but that of course proved impossible.

Although the right answer is achieved by not carrying the rod through the passages, surely there must be a way of retrieving it first? I would very much like to know.

However, congratulations to *Your Computer* and Acornsoft for mounting a brilliant exercise, I sincerely hope that it will not be the last.

P Croft, County Down, Ireland.

SCROLL TRICK

A feature lacking on the Sinclair Spectrum is the Scroll command. Although substitutions have been published for this, involving Poking and Printing, I believe that my solution is much neater. Simply, place the line, LET A=USR 3280 in your program, and the entire screen will be scrolled up by one line.

Peter Bernstein, Northwood, Middlesex.

POLYGON BUG

The Sinclair Spectrum has a versatile bug in the one-liner

```
PLOT x,y : DRAW a,b, n*PI
```

There is a pentagon at x=y=a=b=50, n=100.8. Odd-sided polygons are usually larger than the circle whose diameter is defined by the line joining x,y and x+a, y+b. Thus they go off the screen, with an Integer Out of Range message. Good examples are the near-perfect triangle spooking about at x=220, y=210, a=b=50, n=168.24, and the heptagon lurking somewhere betweeen n=71.5 and 72.5.

The bug crawls in at n=17 and is cyclic. As odd values of n go up, the circle turns into an apparently rotating polygon. As n rises, the number of sides decrease and the speed of rotation increases, program running time stays constant at eight or nine seconds.

At some point it collapses into a rotating line. I think most of these collapsed polygons are at non-integer values of n. As n increases further the polygon "opens out" and the number of sides increases. The cycle then repeats. For polygons and stars, the trick is to find values of n that visually "locks" the rotation and gives a static shape.

I recommend trying small values for a and b in studying the odd-sided polygons, so that they stay on-screen even if they are very large relative to the circle diameter. I cannot: my Spectrum recently went into terminal coma and is back at Chateau Sinclair for a rebore!

John Brazier, Stanford in the Vale, Oxfordshire.

LYNX FAN

Your review of the Lynx in your February issue prompts me to reply to some of Bill Bennett's comments: He opens his review with the assumption that the consumer wants gimmicks or a computer with some outstanding feature. Any prospective Lynx buyer should bear in mind that some machines with outstanding features have then at the expense of some graphics. If anyone wants gimmicks, I suggest that they compare the Spectrum dead-flesh keyboard with that of the Lynx.

As a ZX-81 owner I know that Sinclair's manual provides one chapter of two pages on machine-code. The Lynx manual's machine-code chapter is nine pages long. I do not think any purchasers can expect a great deal more.

Your reviewer seemed to be disappointed by the Beep command — perhaps he is jaded after all the machines he has reviewed. Anyone wishing to try out Beep need only walk into a branch of Laskys and type in the following ditty:

```
90 RANDOM
100 LET W=RAND(200)
110 LET C=RAND(200)
120 BEEP W,C,63
130 IF W C THEN LET W=W/2
140 IF W=C THEN GOTO 90
150 GOTO 100
```

Our 15-month-old daughter thinks that this beats Beethoven.

I agree that the manual could be improved by the addition of an index — I am sure it will be.

Why was there no mention of the Lynx's ability to accept abbrieviated commands? For example, Auto to A. Also, why no mention of single key entries? I think that indeed the Lynx does indeed offer something new — it is consistently good. It is soundly engineered and it does not overheat. It has a well-designed, professional quality keyboard, and it is British and available.

No doubt by now you have guessed that previously I had been using a ZX-81 and now am the proud owner of a Lynx. Before buying it I looked at the BBC machines. You have to pay another £195 to implement CP/M on the BBC. I personally did not like the Dragon as it was not Z-80 based. Following my bad experiences with mail order from Sinclair, imagine the trepidation with which I ordered my Lynx on November 22, 1982. I had hoped to receive it before Christmas but did anticipate some delay with a brand new machine. Imagine my surprise when I received a letter of apology in the New year apologising for the delay and promising it by mid-January. Sure enough it arrived on January 20. Considering the Christmas holiday I do not think that is a bad record.

I wanted CP/M because I had used WordStar at work and appreciated what a vast range of software would be available to me given that disc-operating system.

R D Hughes, Worthing, West Sussex.

NO STRINGS

Mr Excell seems to think BBC Basic is more standard than Sinclair Basic because BBC Basic supports string arrays — Letters, January issue, p27. In fact, those funny Mid$, Left$, Right$ and similar commands are an aberration of Microsoft-type Basics, and not "standard" at all.

The proposed American National Standards Institute — ANSI — committee X3J2 is currently finalising Standard Basic. It does not include string arrays, and it does make Let mandatory. The original co-author of Dartmouth Basic, and Chairman of the ANSI committee, noted last year that string arrays had gone and cried "Good riddance!" I agree.

Anything that can be done with string arrays can be done with long strings, but not vice versa. Also, string arrays are not a feature, in the Microsoft form, of any more advanced language I can think of. If you want to progress from Basic, it is not a good idea to come to depend on them.

Mind you, I would rather use BBC Basic than Sinclair Basic. BBC Basic is good, but look at the size of it! A better Basic is the Cromemco Struc-

DUTCH DRAGON BOOSTER

With reference to Stephen Mummery's letter — February 1983 — regarding the increase of the Dragon 32's user-available memory, I can add that with the following statement:

```
POKE25,6:POKE27,6:
POKE29,6:POKE31,6
```

you have 31015 bytes at your disposal. You have also cleared the first high-resolution page, which could not be done with the PClear statement. With Clear0 you can add another 200 bytes.

Another useful feature, which you can achieve by changing pointers, is to Merge programs. First you have to Cload the first program. Then you ask the contents of memory locations 25,26,27 and 28 with the command:

```
?PEEK(25),PEEK(26),
PEEK(27),PEEK(28)
```

Next you have to Poke the value of location 27 in location 25 and the value of location 28 minus 2 in location 26 — suppose the value is 137, then you have to Poke value 135 in location 26. If the value of location 28 is 0 or 1 then you have to subtract one from the value to Poke in location 25 and the value to poke in location 26 would be 254 or 255. Now you can Cload the second program. Make sure that all the line numbers are greater than those in the first program. That can be done by the Renum command. The last thing to do is to Poke the original values back to location 25 and 26, which will be in most cases 30 and 1. If you enter the List command you see you have both programs together.

T A Bik, Amstelveen, Netherlands.

tured Basic, which also lacks string arrays, but that's 32K. We should all have so much spare memory.

I own an Atari 800. Atari Basic is a stripped-down version of the Cromemco Basic, written by the same people. It takes up only about 8K, and has long strings instead of string arrays. As it is supplied on a plug-in ROM, however, you can remove it and load an enhanced Microsoft Basic — that is more than twice the size — from disc without running out of memory. Alternatively there is an enhanced version of Atari Basic called Basic A+, available from Optimized Systems Software. Again it was written by the people who wrote Atari Basic, is upward-compatible, and includes the things that had to be left out of the 8K ROM such as Print Using, While — Endwhile, and If — Else — Endif.

The moral is simple. The most powerful feature to look for in a Basic is that you can remove it, or switch it out, freeing the address space either for another Basic or another language.

Jack Schofield
London W3

SPECTRUM TIPS

Here are a few tips for increasing execution speed when writing programs in Basic on the Spectrum. A program's memory may be divided into three parts: the top, the middle and the bottom, each one being more appropriate for the storage of a specific functional part of the program.

The top part, which always has the lowest line numbers, is suitable for frequently-used loops and subroutines — the most-used ones have the lowest line numbers. It is useful to make a subroutine with any frequently-used loop — having taken all unnecessary computations out of the loop — and then put it at the top of the program's memory. It is still better to pack each subroutine within one line only, keeping in mind however that For-Next loops are better at the beginning of a line instead of in the middle. The middle part is used to store the main body of the program.

The bottom part is convenient for functions that are performed only one time per execution, like initialising variables, dimensioning arrays, reading Data statements and so on. It is better to declare variables beginning with those most frequently-referenced first.

The reason for all that is that jumps are always performed by processing through line numbers, starting at line 1, and skipping over to the next line until match is found; thus, the fewer lines away from line 1 you are, the quicker the jump. Do not forget that this gain is multiplied by the number of jumps performed: in French, we say: "Les petits ruisseaux font les grandes rivières"!

André Didelot,
Geneva,
Switzerland.

EDITORIAL

AFTER THE RAVAGES of glue sniffing and teenage alcoholism, the nation's youth are now in the grip of computer addiction. Recent shock reports tell how children sneak back after four o'clock to use their school's computer laboratories, or meet in derelict buildings to program pocket calculators. Parents are warned of the tell-tale signs: the inability to converse in anything but machine code; the complexion horribly coarsened by hours at the keyboard; the eyes vacant except for the cursor flashing in the corner.

Clearly all this makes for good, scare-mongering newspaper stories which are, of course, totally misinformed. Every computer fan knows that you are just as likely to observe this kind of behaviour in adults as in children. A recent survey by Gowling revealed that the father and son partnership makes up 80 percent of home computer owners. Micros are bought for sons by fathers who believe that understanding computing will help their child in school. Presumably as soon as the micro arrives at home some children become users very quickly. In other cases, the father feels he has to get to know the machine if he is to help his son — and becomes hooked in the process. So, what seems to distinguish this addiction from other vices is that parents and children are equally responsible for introducing each other to it. But what is it about computers that makes them so habit-forming?

Some will claim it is the element of problem-solving involved in programming. Others will answer that it is the fact that micros promise mastery of a finite and logical universe contained in a small plastic box. A place where — unlike the real world — if you have the knowledge, what you want to happen surprisingly often does. In other words a kind of hi-tech escapism. Others, still under the influence of a dose of Space Invaders, will be unable to answer at all.

In the old days lecturers complained that all-night drinking and debauchery disrupted students' studies. Now a new villain has emerged. Tutors at London University claim that many undergraduates are spending five hours a night intoxicating themselves with the pleasures of home computing. Students arrive for their lectures fit only for another game of Pac-Man.

So much for the vices but what about the virtues of computer addiction? A physical dependence on micros could make you highly productive — if only in terms of computing. Jobs that can only be regarded as chores by the ordinary owner are fun for the addicts, who see in every new operating system the chance of a kind of electronic nature ramble.

The computer-dependent form an unpaid army of software engineers ready to engage themselves in any national programming cause that appears on their screens. It is exactly because there is this level of obsessional commitment to home computing that such a profusion of software exists in the U.K.

Kids have been addicted to arcade games for 30 years. But whereas the teenage pinball wizards of the past only profited the pier manager, today's silicon whizz-kids are learning skills which could stand them in good stead for their future careers. Some already have careers, programming for the big software houses.

And although critics view the addiction as dangerous, the bank managers of the child prodigies may well be content to see them continue living dangerously. ■

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

Editor
TOBY WOLPE
Assistant Editor
MEIRION JONES
Staff Writer
SIMON BEESLEY
Staff Writer
SIMON BEESLEY
Sub-editor
PAUL BOND
Editorial Secretary
LYNN COWLING

ABC

Editorial: 01-661 3144
Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.
Subscriptions: U.K. £8 for 12 issues.
Printed in Great Britain for the proprietors of Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500 Telex/grams: 892084 BIPRESG. ISSN 0263-0885.
Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1.

Advertisement Manager
PHILIP KIRBY 01-661 3127
Assistant Advertisement Manager
PETER RICE 01-661 8441
Advertisement Executive
BILL ARDLEY 01-661 8484
NIGEL BORRELL 01-661 3127
Midlands Office
KEITH SALT 021-356 4838
Northern Office
RON SOUTHALL 061-872 8861
Advertisement Secretary
JEANETTE MACKRELL
Classified
CLAIRE NOTLEY 01-661 3036
Publishing Director
CHRIS HIPWELL

© Business Press International Ltd 1983

Happy birthday Microdrive — and now a big hand for the ZX-83, ZX-84 and Microvision

YOU WILL be able to order the Microdrive on or about April 23 — the anniversary of its official announcement. Sinclair also has a ZX-83 in store for us this year, but the revolutionary all-in-one computer exclusively revealed in last November's *Your Computer* is now dubbed the ZX-84 and may not be released until next year.

Sinclair's long awaited Microdrive is a compromise between cassette storage and floppy-disc storage. A high speed tape loop — or stringy floppy — will store over 100K of data or programs. Sinclair is confident that the access time will be less than the 3.5s. advertised.

The £40 prices is less than originally expected but a £30 drive controller containing an RS-232 interface is necessary to connect the Microdrive to a Spectrum.

Initially Microdrives will not be able to run on any other computers, although one controller will allow you to run up to 40 Microdrives off one Spectrum.

The Microdrives will accept interchangeable tape-loop cassettes. Initially Sinclair will sell games and adaptations of existing Spectrum software on these cassettes. Blank cassettes will be made available to other software manufacturers.



Priority will be given to satisfying the Microdrive orders of these who ordered Spectrums last summer, so it could be late this summer before the microdrive goes on general release.

Sinclair's Microvision flat-screen pocket television should be launched this July, opening the way for the 9in. flat-screen to be incorporated in the ZX-84, which will also have twin Microdrives and a Modem.

Nigel Searle, Sinclair Research's Managing Director is playing his cards close to the ZX-83, but he has confirmed that there will be one — "It is fairly natural if you follow the sequence: ZX-80, ZX-81, Spectrum — alias ZX-82".

Your Computer spies have observed several projects which could be the ZX-83 under wraps at Sinclair's new Cambridge headquarters. One of the favourites is a Spectrum with improved sound capabilities and a Modem which could be rushed into production if the Oric begins to threaten Sinclair's hold on the market.

The situation is further confused by the low-cost desktop business computer which Sinclair has developed for ICL to launch this year.

YOUR COMPUTER TOP 20

Game	Company	Machine
Arcadia	Imagine	Spectrum
Chop Liter	Creative Software	Vic-20
Defender	Atari	Atari
Dragon Trek	Salamander ·	Dragon
Flight Simulation	Psion	ZX-81
Football Manager	Addictive Games	ZX-81
Gorf	Commodore	Vic-20
The Hobbit	Melbourne House	Spectrum
Hungry Horace	Psion	Spectrum
Intro to Programming	Commodore	Vic-20
King Kong	T D Software	ZX-81
Miner 2049er	Big 5 Software	Atari
Monsters	Acornsoft	BBC
Pimania	Automata	Dragon
Planet Invasion	Microdeal	Dragon
Planetoids	Acornsoft	BBC
Rocket Raid	Acornsoft	BBC
3D Defender	J K Greye	ZX-81
3D Tunnel	New Generation	Spectrum
Timegate	Quicksilva	Spectrum

The difference between an Apple and a Peanut is just £300

THE APPLE II costs £675. From mid-April Peanut Computers will be selling an Apple look-alike with virtually the same specifications at just over half the price.

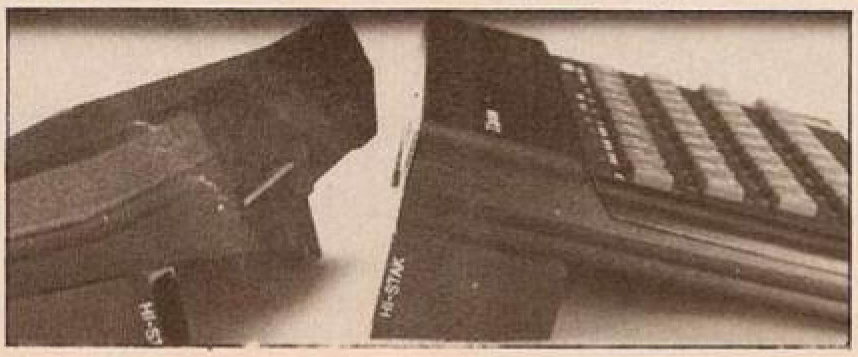
Like the MPF-II, another Apple copy, the Peanut is imported from the Far East. It is designed to run Apple software and to take many of the large range of Apple II accessories. These include RAM expansion boards, Z-80 interface to allow the computer to run CP/M software, language cards and an 80-column display card.

The standard machine comes with 48K RAM and is expected to sell for around £345. Two graphic modes are offered, giving a resolution in black and white of 280 by 192 and colour resolution of 140 by 192. The text format provides 40 columns by 48 rows. It will be sold by mail order from Peanut Computers, Unit 20, Low Mill, Dewsbury, West Yorkshire.



The Apple II E — Apple's latest attempt to stave off Apple II copies.

Just propping up the back of your home micro can save it from overheating and certainly makes it easier to type on. While most computerniks lean their slices of 1980s high technology on cassette cases, door wedges or stale sandwiches, Hi Stak plastic legs are the latest spring fashion. Warp Factor Eight sells them at an appropriately astronomical £3.95 for two. If you use something really obscure to prop up your micro, write in and tell us and we will send you a pair of Hi Staks.



Check your power packs

SINCLAIR RESEARCH has been obliged to recall some 28,000 power packs after discovering that they could be dangerous.

The power packs are recognisable by a white stripe on the power supply's output to the Spectrum.

What makes them unsafe is that the 240V input track inside the power supply is too close to the 6V output — it is possible that a power-spike during very humid weather could result in a user receiving an electric shock.

Sinclair Research Managing Director Nigel Searle admitted that the power packs — just one batch from one supplier — were not checked in detail for safety.

BBC Micros for the blind

A GRANT worth £18,000 from the Department of Industry will help the Open University to open up microcomputing to the blind and partially-sighted. Eight schools will be supplied with "touch and hear" systems based on BBC Micros equipped with speech synthesisers.

The system reads lines of Basic aloud as they are entered using a Votrax-based Type and Talk synthesiser instead of displaying them on the screen. So instead of, say:

```
10 PRINT CHR$(23)
```

appearing on the tube you would hear

TEN PRINT CHARACTER TWENTY-THREE

Many blind people cannot use a conventional typewriter keyboard but are familiar with a manual Braille typewriter, the Perkins Brailler. So Dr Thomas Vincent and his Manchester Open University team which has been developing the system over the last year has adapted the Perkins machine as an alternative keyboard for the BBC Micro by fitting microswitches to sense key depression and an interface to the BBC Micro.

Vincent hopes that the micros will stop the blind children from being left behind as computer skills become more widespread. It should also make it easier and more enjoyable to learn Braille.



Versatile new portable from Texas completes the TI family

THE STRUGGLE to win a place in the nation's briefcase becomes even more heated with the launch of the Compact Computer 40, the first in a series of Texas Instruments portable computers. Texas clearly intends it to compete with the Epson HX-20.

Like the Epson computer it has an liquid-crystal display , a QWERTY keyboard and a numeric keypad. The display has 31 characters, can be scrolled left and right and adjusted for different contrasts.

Measuring 9in by 6in, by 1in, the CC-40 weights 22oz. and takes four AA alkaline batteries which provide power for up to 200 hours. Programs are retained in memory when the machine is switched off.

Memory capacity is 6K of RAM expandable to 18K, and 34K ROM. Plug-in cartridges can expand the ROM by a further 128K. The Basic is compatible with the TI Basic used in the TI-99/4A and the new TI-99/2 announced last month.

The CC-40 will also take the same low-cost peripherals as the TI-99/4A. These include a £150 four-colour printer and the £120 Wafertape digital tape drive which takes 40K tape cartridges and has a data-transfer rate of 8,000 bits per second.

A RS-232 interface will also be available and at later date Texas will release other peripherals such as a Modem, a bar-code reader and a TV interface.

The CC-40 is expected to sell for around £170. Texas claims that it has more capabilities than the Epson portable computer and that it will be considerably cheaper — even with the additional cost of the printer and tape drive.

Double Dragon will answer the 64,000 byte question

WATCH OUT Commodore and BBC, Dragon Data plans to launch a new 64K RAM machine late this summer. The £180 Dragon 32 which has now sold 35,000 units will not be discontinued when the £300 64K machine goes into production.

Commodore at least will be well able to drop the price of the Commodore 64 if the competition gets too hot. A spokesman refused to deny persistent rumours that new technology makes the £350 64 cheaper to produce than the old £130 Vic-20 and would only say that price was "all to do with what the market will bear — not to do with what it costs to make".

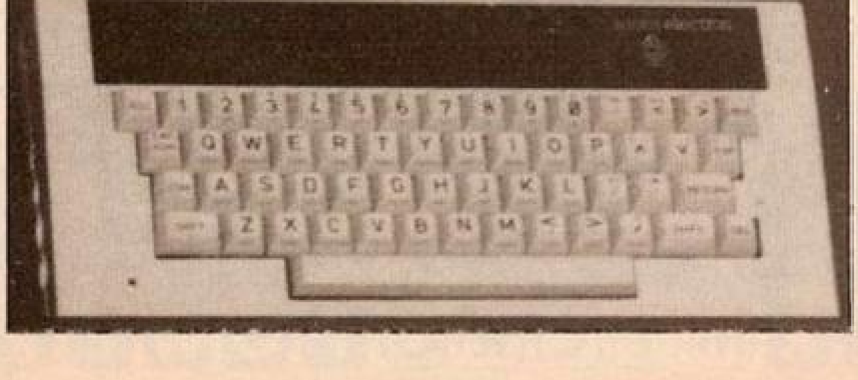
Not some new video-game monster but a face which may be just as frightening for some of the big names in micro games. It belongs to Richard Branson who made millions from Virgin records and is now turning his evil eye to home computers. Nick Alexander will run Virgin Games which will bring record-company style razzmatazz to computer games. Nick Alexander reckons that computer games will soon become even more popular than video films.



Cut-price rail tickets offer for first Midland Computer Fair

WHISPER IT softly but Acorn's Electron may receive its first public showing at the Midland Computer Fair — and combined rail fare and admission tickets will cut the cost of getting there.

Acorn's Electron should be out by the end of April.



Tens of thousands of home computer enthusiasts are expected to turn up to the Fair at Bingley Hall Birmingham which will be open from 10am to 6pm on Thursday and Friday April 28 and 29, and 10am until 5pm, Saturday April 30.

Admission will be £2 — half price for children and pensioners — but British Rail and IPC Exhibitions are offering cut-price all-in fares; such as £12 from any station in London, £9.50 from Manchester, £4 from Coventry and £4.50 from Hereford.

PROGRAMPOWERMICROPOWER

GREAT NEW DEALS FROM MICRO POWER

BBC MICRO

Model	£325.00
Model A (32K)	£349.00
Model B	£399.00
Memory Upgrade	£25.00
Full Upgrade	£75.00
Joysticks (pair)	£13.00
Single Disk Drive	£265.00
Disk Interface (fitted)	£119.00
14 inch Colour Monitor	£309.00
20 inch Colour Monitor	£343.85
ACORNSOFT PROGRAMS (phone for availability)	

ACORN ATOM

Single Disk Drive (incl. FREE buffer kit)	£343.85
ATOMCALC ROM	£39.10
WORK PROCESSOR ROM	£29.90
FLOATING POINT ROM	£23.00
ROM Selector Board	£22.40
BBC BASIC Board	£49.95
Programmer's TOOLBOX	£20.10
SUPER TOOLBOX	£16.60
M/C CODE MONITOR/DISASSEMBLER	£16.60
PRINTERS	
EPSON MX80 F/T III	£399.00
EPSON MX80 T III	£349.00
STAR DP 8480	£279.00
SEIKOSHA GP 100A	£229.00
Printer Leads (BBC/ATOM/DRAGON)	£15.50
BOOKS	
Assembly Language Programming for the BBC Micro	£8.95
BBC Micro — Instant Machine Code	£7.95
BBC Micro Revealed	£7.95
Basic Programming on the BBC Micro	£5.95
Let Your BBC Micro Teach You to Program	£6.45
NEC '30 Hour BASIC'	£5.95
Practical Programs for the BBC Micro and Acorn Atom	£5.95
Getting Acquainted with your Acorn Atom	£6.45
39 Tested Programs for the Acorn Atom	£6.45
Atom Magic Book	£5.50

- *SPACIOUS SHOWROOM OPEN MON. to SAT.
- *FRIENDLY AND HELPFUL STAFF
- *EXPERT ASSISTANCE ALWAYS ON HAND
- *GOOD RANGE OF COMPUTER BOOKS
- *AFTER SALES TECHNICAL BACK-UP and SUPPORT

The Colourful

DRAGON 32



THE FAMILY COMPUTER TO FIRE YOUR IMAGINATION

KEY FEATURES

- **32K RAM as Standard, Expandable to 64K
- **Display:
  9 colours available.
  5 different resolutions from 16 x 32 to 256 x 192.
- **Extended MICROSOFT Colour Basic as Standard.
  Advanced graphics commands.
  Advanced Sound
  Full Editing—insert, delete, amend.
- **Professional Typewriter Keyboard
- **FREE 160 page 'BASIC' training manual.
- **Connections for Joysticks, Printer, Cartridges and Cassette.

PRICE ONLY **£199.50** incl. V.A.T.

THINK DRAGON !!
THINK MICRO POWER!!

DRAGON SOFTWARE PRICES SLASHED!

CARTRIDGES
Chess
Ghost Attack
~~£24.95~~ NOW only **£21.95**

Berserk
Astroblast
Meteoroids
Starship Chameleon
Cave Hunter
~~£19.95~~ NOW only **£17.95**

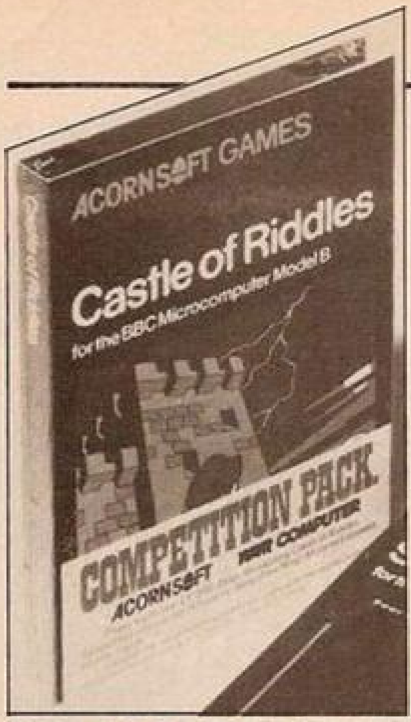
CASSETTES
Dragon Selection 1
Dragon Selection 2
Quest
Graphic Animator
Computavoice
Calixto Island
Black Sanctum
Dragon Mountain
~~£7.95~~ NOW only **£6.95**

MICRO POWER LTD.
Dept. YC3
8/8a REGENT STREET,
CHAPEL ALLERTON,
LEEDS LS7 4PE
Tel: (0532) 683186
or 696343

Carriage FREE on cash/cheque orders over £100
All prices inclusive of V.A.T.

VISA

PROGRAMPOWERMICROPOWER



£3,000 Riddle — the winners

NOW IT CAN be told — the names of the winners of the *Your Computer* and Acornsoft Castle of Riddles competition. Peter Voke from Aylesbury, Buckinghamshire was the first to deliver the right answer, in person.

Second was C P Bignell of Littlehampton, West Sussex and, in third place, P K Colbert of Heath, Cardiff. Next month, we will publish fuller details for those of you still stuck in the Pit or over-awed by the Awesome Creature.

Down with the Atari 400

ATARI IS LAUNCHING a three-pronged attack on micro users. Prices of the 400 series home computers have been slashed by £40 to £160 for the bare 16K RAM machine or £200 if you want Basic and the manuals. Meanwhile the £400 Atari 800 has been upgraded from 16K to 48K RAM without a price increase and a conversion kit will soon be available to turn the Atari video games machine into a home computer.

Maestro and Renault II pop talking micros under the bonnet

AT LAST motor manufacturers are waking up to the possibilities of on-board microcomputers. Computers have been creeping into luxury cars like BMWs for the last couple of years but only with the announcement of the Renault 11 and the Austin Maestro last month has the micro appeared in volume production.

The Austin and Renault systems are a similar size to the average home computer with the addition of a voice synthesis unit which again is similar to some of the plug-in peripherals available for home computers. The Maestro's unit is based around a 6805 microprocessor running at 4MHz. 32K ROM is used to store 15 phrases such as "Fasten your seat belt" including warnings of high engine temperature or low fuel.



In Britain the voice is female but a further 128K ROM on export models incorporates German, French and Italian voices. The French have also opted for a female voice but the Germans and Italians will be warned by male voices. The Germans will be confronted by a barking "Achtung, achtung", every time they step out of line.

Renault has opted for a similar voice unit on the Renault 11 — a fastback version of the top-selling Renault 9. A female voice will regale the driver with advice while a male voice will shout warnings.

The Maestro's voice unit will only be available on the top of the line Vanden Plas and MG models but the microcomputer will control speed and temperature sensors on all models and will power a digital display board. Smiths Industries who makes the unit claims that the vacuum fluorescent display of speed and fuel consumption is 20 times brighter than a television screen.

Austin's Maestro — below — and the Renault II — above.



Computer garages to fix micros on the spot

HIGH STREET computer garages where you can take in an ailing micro and have it fixed on the spot for a fixed fee of £10 are the latest idea from Liverpool software house Imagine.

Sending your home computer back to the manufacturer after it gives up the ghost in the middle of a game of Pac-Man can be a frustrating business. With horror stories of people waiting up to a year for repaired machines to be returned, Imagine's Mark Butler is confident of the demand for a simple High Street repair service.

The first computer garages will appear in Liverpool but Mark Butler is already negotiating with an Oxford Street store and hopes to set up branches all over the country. The garages will deal with Spectrums, ZX-81s, BBC Micros, Dragons, Vic-20s and Atoms.

Previously Imagine was better known for games like Wacky Waiters and Ah Diddums but although Butler claims that 70 per cent of Spectrum owners now have Imagine's Arcadia, it has not starred in *Your Computer's* retail Top 20 because most of the sales have been by mail order.

Now you can plug your Spectrum straight into a professional printer using the new Euroelectronics ZX Lprint Centronics interface. This parallel interface will free Spectrum owners from dependence on Sinclair peripherals and will be tough competition for Sinclair's serial RS-232 interface which should be launched this month. Both the ZX Lprint and Sinclair's RS-232 should cost around £30.



Bob Dickens of RD Labs has had to head for the hills because of Your Computer. *Sales of the Digital Tracer — a device which allows you to copy drawings straight to the screen with a Spectrum or ZX-81 — have proved so successful since we reviewed it in January that RD Labs has had to move to a new factory in Cwmbran, South Wales.*



VOLCANIC DUNGEON CHAMPIONSHIP

CARNELL SOFTWARE



WIN A FABULOUS 'WINGS' HOLIDAY FOR 2 TO FLORIDA.

VISIT THE AMAZING NEW EPCOT CENTRE

Volcanic Dungeon, the addictive adventure. People have been known to venture into its maze of caverns to rescue the Princess Edora again and again. If you are one of them, or wish to be, then you could find yourself lying on a **sun-drenched beach in Miami for a week. Followed by a further week at Orlando**, visiting **Disney World** and **Epcot**. So what do you have to do for all this? **Just be the best Volcanic Dungeon player in the UK, that's all!** Ten finalists will battle it out in the championship at the London Computer Fair, Earl's Court, in June 1983. **But first you must prove you are worthy.**

Volcanic Dungeon is available on the **16K ZX-81, 48K Spectrum and Dragon 32.** An entry form is supplied with every game. (Anyone who already owns the original ZX version can enter by sending a SAE for an entry form.) **Order your copy NOW** from **CARNELL SOFTWARE, 4 Staunton Road, Slough, Berks. Only £5.00** including P&P. **Also available from good microcomputer stores.**

The Judges' decision is final and no correspondence will be entered into. All business associates of Carnell Software, and their relatives, are disqualified from entry. A copy of the rules of the Volcanic Dungeon championship will be supplied with the entry form.



GET THE BEST NEW PROGRAMS AND THE ALL-TIME GREATS, SPECTRUM OR ZX81

AT SOFTWARE SUPERMARKET NOW

We started Software Supermarket with just one idea. To play all the Spectrum and ZX81 games we could find, to select the very best, and to offer only those to our customers.

Judging by our mail from all over the world, you're very pleased with our free selection service. It's impartial (we produce no programs ourselves) and it saves you £££'s on stamps and mistakes.

And it's fast. We usually despatch your order within 48 hours. Here's the best of the new and the best of them all for your Spectrum. Plus some great ZX81 games. Full detailed catalogue sent free with every order. Or send large SAE for catalogue only.

ZX SPECTRUM: 16/48K

Our latest Top 10 Programs for your Spectrum. They run on both 16 & 48K.

3D TUNNEL Brilliant NEW 3D graphic game by Malcolm "Escape" Evans. Fly down the winding 3D tunnel shooting bats, spiders, frogs and rats! Demo mode: 3 speeds: training program for each phase. And (48K only) watch out for the Tube train! (New Generation) £5.95

3D TANX NEW game with stunning graphics. Shoot the enemy from your 3D tank turret. 3 play levels: accurate ballistics: 1 or 2 players: hold feature: demo mode: training program. And choose your own control keys: even plays 'God Save The Queen'! (DK'Tronics) £4.95

WINGED AVENGER *"One of the best...covers all the stages of the arcade original...a game to come back to." Pop:Comp:Wkly.* Very fast 'PHOENIX'. 7 play levels: 3 attack waves: laser shield: mothership with smart bombs. (Work force) £4.50 (16K ZX81 version. £4.50)

GROUND ATTACK *"Best Spectrum version of the arcade game" Yr:Comp "Very absorbing" E&C "Extremely good" Pop:Comp:Wkly.* Thrilling SCRAMBLE'. Pilot your ship thro' 26 zones: up, down, brake, thrust: smart bombs: as you get better, it gets harder. (Silversoft) £5.95

CENTIPEDE The first - and fast - Spectrum version of the famous arcade game. Full arcade movement - left, right, up, down, fire - as you attack the centipede. Great graphics. Watch out for the jumping spider! 3 lives: hold feature. (DK'Tronics) £4.95

ESCAPE *"One of the best and most original games we have seen" S.User.* 5 very real dinosaurs chase you round the maze as you search for the axe to escape. Different maze every time. 5 play levels: 9 speeds: Hall of Fame. (New Generation) £4.95

GULPMAN *"The one cassette that I would buy...an exceptional program." Pop:Comp:Wkly* 15 mazes, each with demo mode: 9 speeds: laser gun helps against 4 chasers. Program your own control keys: personalise/save your very own game. (Campbell) £5.95

COSMOS NEW! Fantastic graphics. Loads in 2 parts (instruction manual first). Protect your 9 ships against 18 aliens, warp mines, asteroids. Your graphic on-board computer helps with elaborate displays. Our favourite new game. (Abbex) £5.95

FAUST'S FOLLY The first adventure we've seen that's worth playing in 16K. It's great and it's got graphics! Loads in two parts: clear instructions first. Then a smashing adventure with directions, inventory, look, score, save. Amazing! Abbex) £5.95

OTHELLO *"Recommended without reserve...a superb opponent" Yr:Comp.* The great 19th Century power game. Surround your opponent: capture his territory. Millions of different games: maximum 60 moves each. 1 or 2 players: demo game: 9 skill levels: print. (MoI) £7.95

ZX81 OWNERS!

Special 16K ZX81 versions of 6 of these programs are available:

WINGED AVENGER	**£4.50**	**PIMANIA**	**£8.00**
OTHELLO	**£6.95**	**CHESS 2**	**£9.95**
BLACK CRYSTAL	**£7.50**	**GREAT BRITAIN LTD**	**£4.95**

Use the coupon to order. Free detailed catalogue of our best ZX81 games with every order. Or send large SAE for catalogue only.

48K SPECTRUM ONLY

These programs use nearly all the Spectrum's 48K. They will not run on the 16K Spectrum. But there are versions of Black Crystal, GB Ltd, Pimania and SpecChess for for 16K ZX81.

PIMANIA *"The best adventure game we have reviewed" S.User. "An adventure enthusiast's dream" C&V Games.* Best use of Spectrum graphics and music we've seen. A wonderfully witty adventure - and you could win the £6,000 Golden Sundial of Pi. (Automata) £10. (ZX81 16K version: £8)

TIMEGATE *"The best graphical game I have seen on any micro" Interface. "Excellent graphics...one of the best" Yr:Comp. "Fast and furious...required playing for any Spectrum owner" Which Micro?* 5 skill levels: training program: Hold: Hall of Fame: keyboard overlay: 26-page on-screen manual. (Quicksilva) £6.95

THE HOBBIT *"Superior to any other adventure game available for the Spectrum" Yr:Comp.* Free 285-page illustrated book of The Hobbit contains clues to help solve the adventure. 30 beautiful full-screen pictures: 500 word vocabulary: 16 page instruction manual: save: print: pause. It took 4 people 18 months to write! (Melbourne House) £14.95

GREAT BRITAIN LTD *"A colourful and sophisticated management game" Pers:Comp:wld. "Difficult and challenging" ZX Comp.* Even plays 'Rule Britannia'! Choose your party and run the country. Will inflation and unemployment come down or the rioters come out? It's up to you. Then watch the results on election night! (Hessell) £5.95 (16K ZX81 version. £4.95)

SPECCHESS *"The standard for ZXChess" ZX Comp. "The strongest chess program" Pop:Comp:Wkly.* Full graphic chessmen: 7 play levels: all legal moves: position analysis for problem-solving: recommended move option: print game history. (Artic) £9.45 (ZX81 non-graphic 16K version £9.95)

BLACK CRYSTAL Take the adventure of your life. 180K of program to unravel, on two thrilling cassettes! You must solve each of the 6 stages to defeat the Lords of Chaos. Real-time monster battles: 16 command keys. (Carnell) £7.50 (16K ZX81 version: Over 100K loads in 7 parts. £7.50)

Post to: SOFTWARE SUPERMARKET, 87 Howard's Lane, London, SW15 6NU.

If you do not want to cut this magazine, write your order out carefully on plain paper and quote this number: **YC8** Mail Order Only.

I own a 16K Spectrum ☐ 48K Spectrum ☐ 16K ZX81 ☐ (please tick)

I enclose my Cheque/PO for £.................... payable to Software Supermarket.
Please use block capitals. If we can't read it, you won't get it.

Name ....

Address ....

....Postcode ....

Phone, if any, in case we have any query ....

Program Name	Computer	Price

POSTAGE AND PACKING	U.K. Add 55p only per order	£
	EUROPE. Add 55p for each program	£
	OUTSIDE EUROPE. Add £1 for each - program airmail	£
	TOTAL	£

SOFTWARE SUPERMARKET

87 Howard's Lane, London SW15 6NU. 01-789 8546

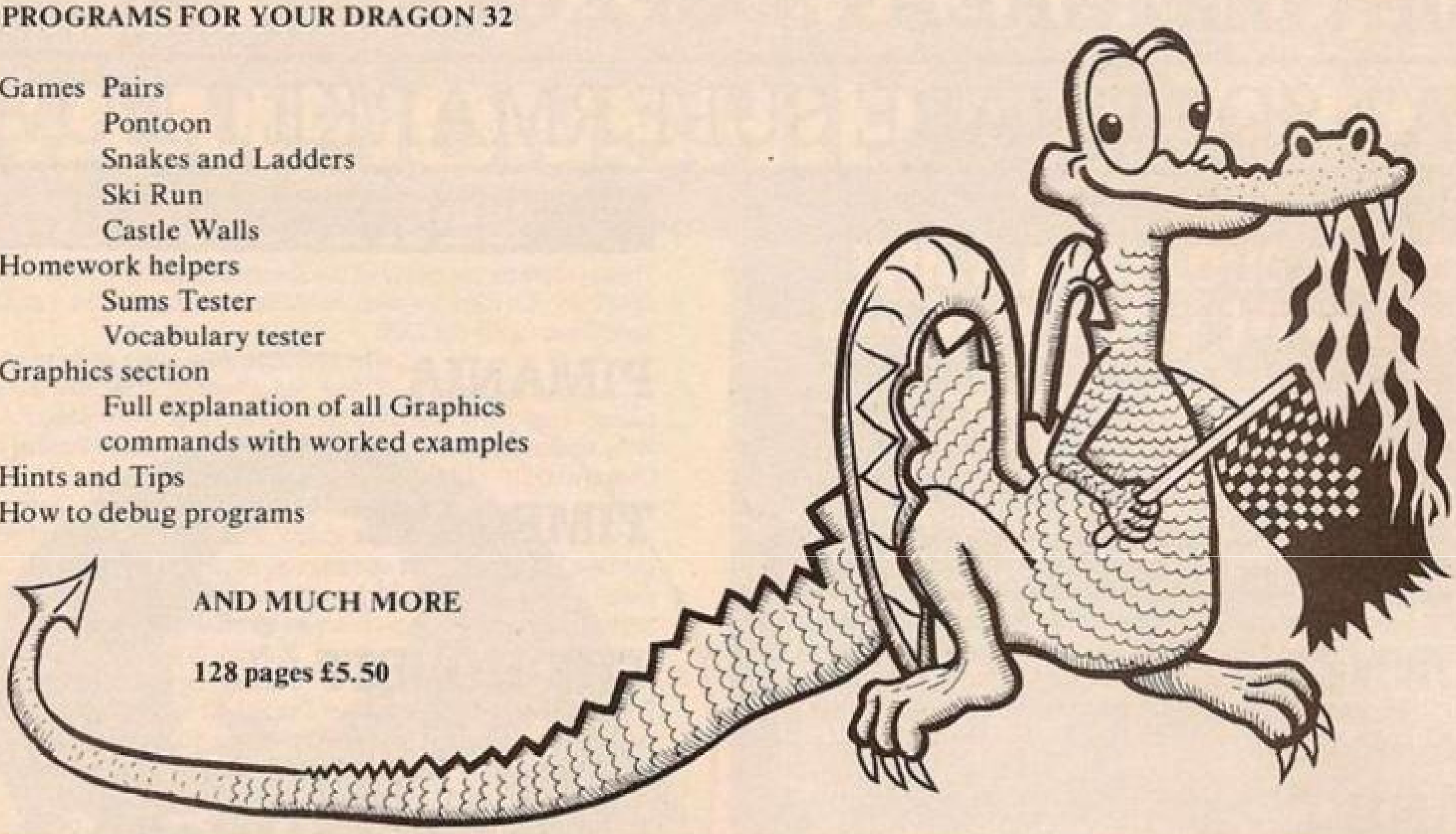
LOAD AND GO WITH YOUR DRAGON

32 PROGRAMS FOR YOUR DRAGON 32

- Games Pairs
  - Pontoon
  - Snakes and Ladders
  - Ski Run
  - Castle Walls
- Homework helpers
  - Sums Tester
  - Vocabulary tester
- Graphics section
  - Full explanation of all Graphics commands with worked examples
- Hints and Tips
- How to debug programs

AND MUCH MORE

128 pages £5.50



PHIPPS ASSOCIATES

Dept A FREEPOST EM463 (No stamp required)
99 East St, Epsom, Surrey KT17 1BR.
Telephone 03727-21215. 24hr phone service.

Prices include postage but for air mail delivery in Europe add 90p (outside Europe add £1.70) per item.

Access and Barclaycard accepted

THE SPECTRUM POCKET BOOK

160pp £6.50

Trevor Toms, best selling author of the ZX81 Pocket Book and the Sinclair Learning Lab, turns his attention to the ZX Spectrum — the book you have been waiting for! All the material in the book is totally new.

Programs

- Castle walls; boiling oil and lovely slurping noises
- Great Fire of London; try and change the course of history
- Chase; outwit the pursuing robots and lead them to their doom
- Truly amazing; generate a new maze puzzle every go
- Reversi; the classic oriental strategy game with board screen display
- 3D Maze; race against time and three dimensions to escape.

Also Available

ZX81 Pocket Book 138pp	£5.95
ZX80 Pocket Book 128pp	£4.95
Atom Business 110pp	£7.50

Hints & Tips

Discover new ways of using PRINT; INSTR functions, VAL, PRINT USING, hexadecimal conversion, upper case conversion, load and save arrays. BEEP with sliding tones, automatic scroll and how to use all the machine features within machine code.

Machine Code

All the tools you need to write machine code effectively. Graphics tool kit — debug monitor — symbol assembler (with labels, all ED commands, ORG statements, forward and relative jumps) — disassembler (with label assignment); now you can really dig into the Sinclair ROM! This section alone would be stupendous value for money!

Cassettes

	Spectrum games as opposite	£5.00
	Spectrum machine code as above	£5.00
for ZX81	Nowotnik Puzzle, Demolition & Tenpin	£5.00
	3 Adventures: Greedy Gulch, Magic Mountain, Pharaohs Tomb	£5.00
Prices include VAT	ZX81 Pocket Book Cassette	£5.00

PHIPPS ASSOCIATES

Dept A FREEPOST EM463 (No stamp required)
99, East St, Epsom, Surrey KT17 1BR.
Telephone 03727-21215. 24hr phone service.

Prices include postage but for air mail delivery in Europe add 90p (outside Europe add £2.20) per item.

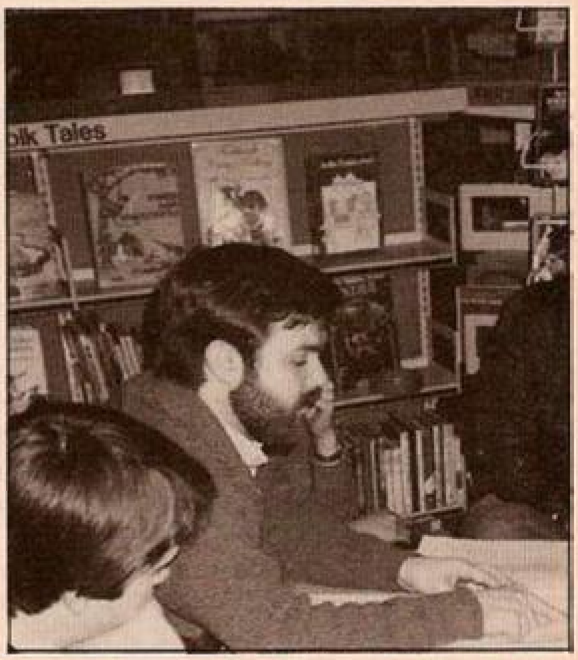
Access and Barclaycard accepted

Computer Club is here to encourage you to start your own local computer club or, if one already exists, to join it and become involved. We would like to hear of anything which has made your club a success, or of any projects or programs you are developing.

Camden keys in at Queen's Crescent

Meirion Jones takes a look at what's happening down in North London at the burgeoning new club based at Queen's Crescent library in Camden.





WHILE ANNA FORD, David Frost and the rest of TV-am's megastars were launching themselves from Camden Lock on to the nation's breakfast tables with a "Hello, good morning and welcome" a quieter but perhaps more effective launch was being prepared down the road at Queen's Crescent library.

It all started with a chance enquiry by Wil Jackson at his local library. Why, he wanted to know, did they have so few books about new technology? "You would be surprised how many people who come in here have their own computers," he told Branch Librarian Jean Walton. She made him her computer books adviser, and by February there were 50 computer titles on the shelves and it was time to set up a computer club. Camden Council gave free use of the library where the club has met every Tuesday at 7pm since.

The club concentrates its efforts on newcomers to computing with two beginners' groups and a more advanced programming section. Many of the 30 members who attend each week are still at school.

When we visited, one group was huddled around a Spectrum in the hands of Simon Warren — a radio engineer. They had mastered the essentials of Basic and he was showing them how to debug a program — in this case an error-prone version of Nim. Simon showed how to trace problems in a program but the final error proved elusive and so the group learnt an unexpected lesson — knowing when to give up.

Wil Jackson, who is now the chairman, was explaining the rudiments of computing to newcomers using another Spectrum. In another corner Lucas Fowler the club secretary was demonstrating a ZX-81 input/output board which he had made for an O-level electronics project.

Robert Martin — a professional programs analyst — was explaining structures to the more advanced programmers and advocating flowcharts. He also warned against becoming so obsessed with the program that you forget what you want it to do. "If you proceed from the output you cannot go wrong. If you find a bit of the program interesting and start there you can lose sight of the overall objective — and end up with spaghetti programming."

The club is increasing its links with other groups. While we were there a missionary from Worcester Park preached the benefits of joining the Association of London Computer Clubs.

Camden Council is hoping the Queen's Crescent project will be a success so it can be spread to other libraries in the area. Wil Jackson hopes the effect will be "like ripples on a pond. From Kentish Town to Primrose Hill — and from there you never know where we will get to."

You can find out more about Queen's Crescent Computer Club by calling in at the library or ringing Jean Walton on 01-485 4551. ■

Local society news

Amateurs in Spennymoor

SPENNYMOOR AMATEUR Computer Club in Country Durham meets every Thursday evening at the Spennymoor Recreation Centre. Members own a wide range of home computers, and new members plus their micros are always welcome. More details from Anthony Vincent on 0388-817304.

Stevenage Sinclairs

A COMPUTER CLUB for owners of Sinclair machines has been formed in Stevenage. It meets on the first Wednesday of each month at the Stevenage Library. Telephone John Pearce on 0438-50587 or Bill Googe on 0438-54758 for details.

South Trafford computes

SOUTH TRAFFORD Microcomputer club meets once every two weeks and puts out a monthly newsletter which contains courses in Basic and machine code. The club is open to all serious users with an interest in learning or exchanging ideas. For further details write to Ian White at 16 Leicester Avenue, Timperley, Altrincham, WA15 6AR or phone him on 061-969 2080.

Yate and Sodbury

YATE AND SODBURY Computer Club formed only recently but 80 people attended its second meeting. The club meets on the third Monday of the month in the canteen at Newmans, Station Road, Yate. You can telephone the secretary, Kay Crowe, on 0454-517461.

Brentwood buffs

MEETINGS of the Brentwood Microcomputer Club are held every two months on the third Monday of the month at the Methodist Hall, Warley Hill. The next meeting is on May 16, starting at 7.15pm. The club regularly organises talks and demonstrations. Future meetings will include a visit from a Commodore representative and a talk on network programming. Contact Allan Holland on 0277-221620 for further information.

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

QUESTIONS

What are the arrows?

'Tell me more about the cursor control keys. How are they used to control movement?'

LURKING SOMEWHERE on every computer keyboard are the four cursor control or arrow keys which are of particular importance in editing programs, and other text, and in controlling on-screen movement in games.

When you are entering program lines you will find that the left arrow — backspace — often acts as a delete key and will erase the last character which you typed. If your particular implementation of Basic has only a line editor then only the left and right arrows are of use to move back and forth along a single line, but if you are fortunate enough to have a full-screen editor then the up and down arrows will also move you from line to line.

Often the cursor symbols are not displayable on the screen and must be dealt with as their ASCII character codes which are as follows:

	shift not pressed	shift pressed
left arrow	8	21
right arrow	9	93
up arrow	94	95
down arrow	10	91

Organising movement around the screen must take into account how the screen is mapped. The following routine sorts out the four movements in both upper and lower case for a screen addressed as X,Y coordinates.

```
10 X=0, Y=0
20 A$=INKEY$:IF A$="" THEN 20 ELSE
   A=ASC(A$)
30 IF A=8 OR A=21 THEN X=X-1
40 IF A=9 OR A=93 THEN X=X+1
50 IF A=94 OR A=95 THEN Y=Y-1
60 IF A=10 OR A=91 THEN Y=Y+1
90 GOTO 20
```

If you want to ensure that movement does not exceed particular boundaries add:

```
70 IF X<XM THEN X=XM ELSE IF X>XS
   THEN X=XS
80 IF Y<YM THEN Y=YM ELSE IF Y>YS
   THEN Y=YS
```

where XM = minimum value and XS the maximum value of X, and YM = minimum value and YS the maximum value of Y.

Where the screen is mapped sequentially — starting from the top left and returning to the left at the start of each new line — the appropriate lines for modifying the print position (P) are:

```
30 ......... P=P-1
40 ......... P=P+1
50 ......... P=P-LL
60 ......... P=P+LL
```

where LL is the number of characters a line.

I could do that...

Most microcomputers only store integers to eight or nine-figure accuracy. We will award £15 to the shortest program which multiplies two 12-digit numbers and gives the answer to 24-digit accuracy. Entries must be in by the last day in April. Contestants had no trouble in answering March's programming challenge. The winning program was sent in by D Waring, Staddle Stones, Stock Green, Redditch. His solution is simplicity itself:

```
10 INPUT A$
20 LET A$=" "+A$+" "
30 FOR N=0-20
40 FOR M=0-31
50 PRINT AT N, M; A$
60 NEXT M : NEXT N
70 FOR N=20-0 STEP-1
80 FOR M=31-0 STEP-1
90 PRINT AT N, M; A$
100 NEXT M: NEXT N
```

BEATING STOP

DEBUGGING A PROGRAM can be both frustrating and enjoyable. Some people seem to have a gift for homing in at once on the source of a problem. Obviously the more experience you have the more likely you are to develop an intuition for the sort of bugs that cause particular types of error.

But most of us have to adopt a rather more systematic approach and there are several straightforward techniques that can be usefully adopted.

Beginners are often unaware that although a program has crashed, its variables still hold numbers and characters. To find out the value

CHARACTERS PRINTING

ONE OF THE FIRST Basic commands everyone learns is Print which puts characters onto the screen. In its simplest form:

```
10 PRINT "HELLO"
```

The message Hello will apear at the left side of the screen and the print position will then move to the next line below, so that if 20 Print "First Bytes" is added the screen display will be:

```
HELLO
FIRST BYTERS
```

Punctuation is very important in controlling print position as can be seen by placing a comma at the end of line 10, which changes the display to:

```
HELLO                FIRST BYTERS
```

as a comma only moves the next print position some way to the right and not onto the next line.

If the comma is now replaced by a semi-colon the new print position is directly behind the old one giving HELLOFIRST BYTERS which is not very helpful. To stop the two strings running together place a space at the end of the first one to give

```
"HELLO ".
```

Note that spaces are often automatically left either side of numeric variables to keep things tidy without effort.

When you want to put material in columns a Tab — for tabulator — command is useful. This moves the print position to a particular column of the display on the current line and is most useful for tables. Note the careful punctuation which stops your carefully-chosen print position jumping straight to the next line.

```
10 PRINT "DATE"
20 INPUT DA$
30 PRINT TAB(6):DA$
40 PRINT TAB(15);"CREDIT"
50 INPUT CR$
60 PRINT TAB(24);CR$
```

Even more exact control of print position is available through Print @ — or Print At — commands which specify not only the column but also the line of the display, allowing you to jump easily to any point on the screen.

Their exact operation depends on the dialect of Basic and the way the screen display is mapped. Screen mapping is usually one of two types. In the first the print positions are numbered consecutively from the top left hand corner, jumping back to the left hand side of the screen at the start of each new line.

In the second, print positions are defined on an X,Y grid. Thus

```
PRINT AT 10,10; "HERE"
```

on a ZX-81 and

```
PRINT @ 330, "HERE"
```



THE BUGS AND TRACE

of the variables simply type as a direct command

```
PRINT A,B,C
```

or whatever variables you want to look at. You can then work out what values they should have at that stage in the program, and set about finding the point at which they have been corrupted.

Programs that run but do not do what you want them to are even more worrying. The problem may occur because the program is not following the path you intend it to. It may be branching to the wrong subroutine or perhaps may not be returning to the right place.

PRETTILY

on a Dragon both Print 10 lines down and 10 columns across.

For really fancy printing the Print Using facility, which allows you to specify the print format, is invaluable. The structure of this is Print Using format — image of print structure required; output list — what you want to print — and the most common use of this option is in printing columns of cash in a form where only two decimal places are displayed and all decimal points are aligned.

```
10 INPUT C$
20 PRINT USING " # # # . # # ";C$
30 GOTO 10
```

If the following values are input, 123.456: 987.54: 6.4; 4.3211 this is the display:

```
123.46
987.54
  6.40
  4.32
```

Whatever the cause, the first step here is to track down the point at which things are going wrong. A good procedure is to insert Stop commands at different stages of the program and check whether the program runs correctly up to those points. In this way you can eliminate the sections that appear to be working properly and narrow down the trouble spot to a single routine.

One of the most useful debugging aids is a Trace facility. This is built into BBC Basic but some toolkit packages, such as Commodore's Programmers Aid, supply it for other machines.

Trace gives a printout of the line number of each program line before it is executed. A proper Trace facility should also allow you to control the speed at which the program is executed and should print the line numbers in a window in one part of the screen. If these features are not present — as they are not on the BBC Trace — then the line numbers come too fast to follow and overwrite the rest of the display.

If you do not have a Trace facility you can write a simple version yourself: insert a print statement in the routine you want to check telling the computer to print the variables or line number at the top of the screen.

These techniques will not help you if the screen goes haywire or blank and the computer does not respond when you press the escape or break keys.

Almost certainly, in this case, the program has either Poked the wrong location or contains a machine code routine which it cannot break out of program. The only solution is to turn the computer off and start again, right from the very beginning.

Decisions, decisions: branching programs

MOST COMPUTER PROGRAMS involve decisions and have branches in their structure. Although it may appear that the computer has a mind of its own you must always remember that it is only carrying out your instructions to the letter. The simplest type of branch involves testing a variable against another variable — or perhaps an absolute value — and taking some particular action in consequence.

The general form is If condition is true Then take action. for example:

- 10 IF A=B THEN GOTO 100
- 10 IF A=B THEN B=B+1
- 10 IF A=10 THEN STOP

The full form of this type of conditional branch is If condition is true, Then take action 1, Else take action 2, although the latter part is often omitted as, if the first part is untrue, the program will fall through to the next line anyway. Let us consider a situation often found at the start of a program:

```
10 PRINT "DO YOU WANT
   INSTRUCTIONS? (Y/N)"
20 INPUT Q$
30 IF Q$="Y" THEN 1000
40 .......rest of program
1000 .....instructions
```

As you presumably want to return to the main part of the program after reading the instructions Then Gosub 1000 may be better than Then 1000. The test as it stands is OK as long as some clown does not reply with Yes instead of just Y, but if we change 30 to:

```
30 IF Q$="Y" THEN 1000 ELSE IF
   Q$<>"N" THEN 20
```

then only Y and N are acceptable, any other key producing a request for another input.

If you have a complex decision point in a program, such as selection from a menu, then you can use several If-Then tests but things can soon start to look very messy and complicated:

```
100 IF A=1 THEN 1000 ELSE IF A=2 THEN
    2000 ELSE IF A=3 THEN 3000 ELSE IF
    A=4 THEN 4000 ELSE IF A=5 THEN
    5000 ELSE PRINT "TOO BIG"
```

In such situations On Goto or On Gosub can usefully be used instead. The form of this is On expression Goto line number list, where the line number which control passes to is determined by the value of the expression.

If numbers are used in the menu then these can be evaluated directly:

```
100 ON A GOTO 1000,2000,3000,4000,5000
    ELSE PRINT "TOO BIG"
```

To use the letters A to E instead of numbers 1 to 5 you can input A$, determine the ASCII value of this, and then subtract 64 and continue with line 100:

```
80 INPUT A$
90 A=ASC(A$)-64
```

DRAGON SOFT

Once upon a time the Dragon was a fine machine with no software — but now the Brains have picked the best from 100 good programs.

NO HOME COMPUTER will succeed without quality software and plenty of it. The Dragon 32 has been both praised and criticised for shying away from state-of-the-art technology in favour of the tried and tested. In spite of the unfashionable 6809 CPU quantity of Dragon software is not a problem, but how does the quality stand up?

Presentation varies widely from cheap cassettes with hand-written labels to custom-made book-type cases with program notes or separate detailed instruction manuals. Most of the programs were easy to load.

Since the Dragon and the Tandy Colour Computer use pretty much the same version of Microsoft Colour Basic, interconversion of programs was an obvious idea, although there are significant differences between the two machines.

As the cassette-operating systems differ, most Tandy tapes will not load on the Dragon, and only some Tandy cartridges operate correctly, as certain ROM routines are not identical. Only one software house — Microdeal — seems to have followed this route, via licensing deals, for some of the best Colour Computer machine-code software from the U.S.A. We found some of the original author credit lines intriguing as we thought Tom Mix was a pre-war western hero — although as the author of Donkey King and Katerpillar he is certainly no cowboy.

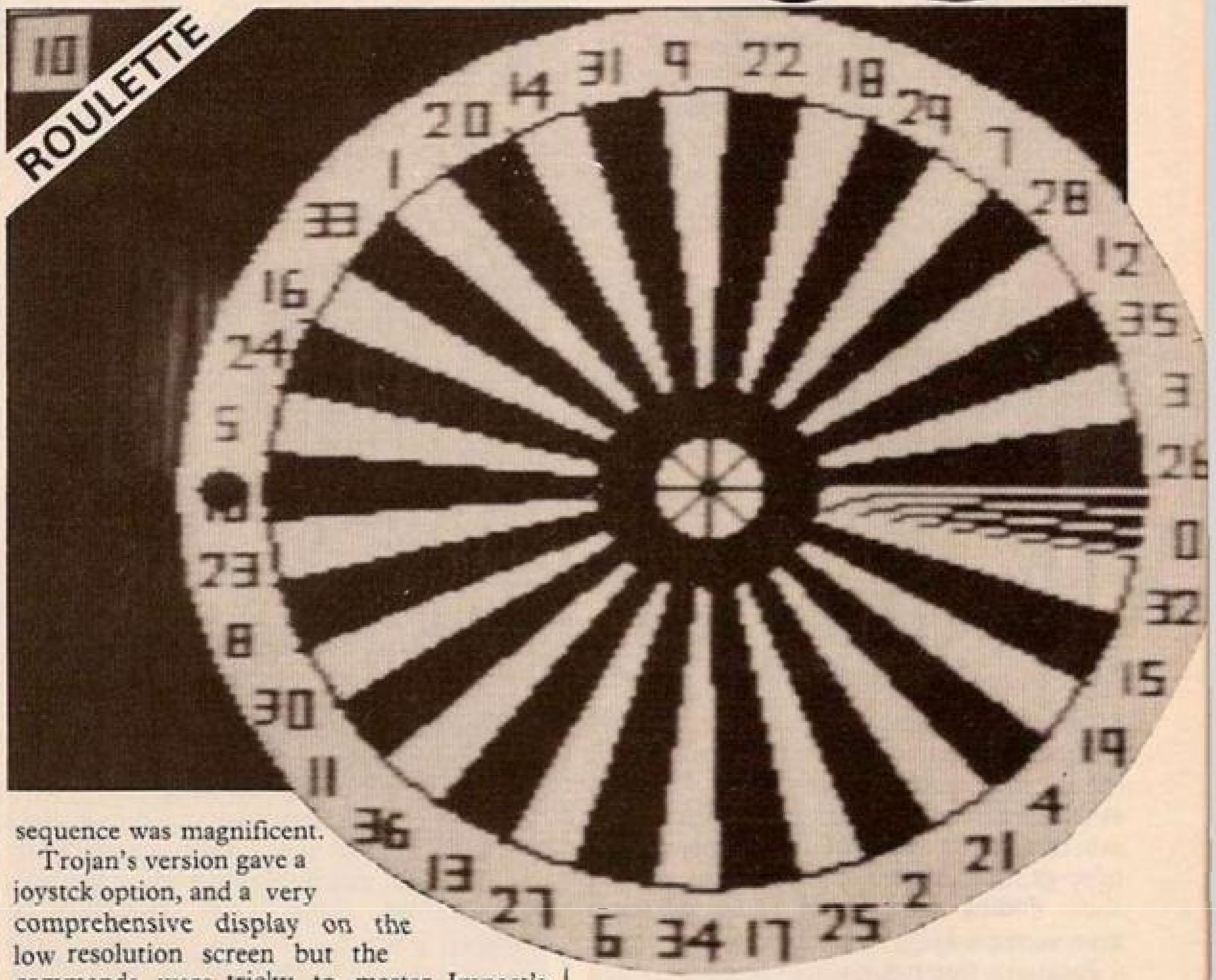
Assessing programs is always difficult as we all appreciate different things. An arcade-game freak looks for close similarity to the original but many people want originality rather than a re-hash of tired old ideas.

Most adventures were traditional text-only types which scarcely exploited the Dragon's capabilities, but they were quite cheap. Taipan is a trading game set in the China Sea, where you travel from port to port buying and buccaneering on the briny. Other adventure games take place in mazes where you roam around collecting valuable objects and weapons, and facing many perils. Scenarios range from seeking treasure in Egypt, questing for the Holy Grail, rescuing stranded potholers in the Mendips, and finding the Orb — whatever that is — we have not found it yet. Pharaoh's Curse from Apex Trading did not seem too powerful and we thought rescue from Death's Head Hole — by Words and Pictures — the most original and interesting.

3-D Maze by Impact Software is graphics only and rather simple. It involves collecting treasure and finding your way out. On the other hand Phantom Slayer, written in machine code, is very fast. It is difficult to zap those hooded phantoms before they get you. If the first shot does not kill it, then run.

Starship troopers

Dragon Trek from Salamander, and Dragon Trek from S W Winter both featured mixed text and graphics on the high-resolution screen and were in real time. This means you cannot wait for ever to make your move. The Salamander version had the largest visual position display, an excellent damage control centre, nice messages from the crew and allowed you to steer photon torpedoes with a joystick, but we must say that the Winter version was also excellent value for money and the picture of the Enterprise in the title



sequence was magnificent.

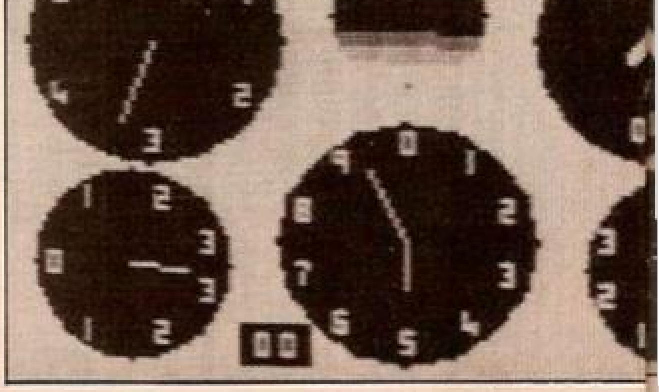
Trojan's version gave a joystck option, and a very comprehensive display on the low resolution screen but the commands were tricky to master. Impact's Star Trek was cheap, hence there are some limitations, but it is worth considering if your Pockets are feeling the strain.

Star Trek III finds it somewhat hard to compete at its price and the Barnsoft version, only using high-resolution in the introductory sequence — which seemed interminable — had very slow response to commands, and fighting Klingons seemed a pretty random process.

The most impressive adventure tested was S W Winter's The Ring of Darkness, which really flexes the Dragon's muscles. A series of sub-programs, each of which is loaded separately, under program control and each constituting a good game in its own right make up the fabric of this game. Having decided what sort of character you want to be, and what particular skills you need, you find yourself on a complex high-resolution map and set out on your search for four rings.

Do you visit a town or buy provisions, weapons or spells and perhaps do a little job on the side for the king, or do you explore deep dark 3-D dungeons infested with giant bats, rats and skeletons? How can you reach those islands, and can you cope with the constant attacks of various foes? A very complex adventure which could take a lifetime to solve. This soon displaced breakfast television in our house.

Many compendia of games, of varying quality, are on offer but all reviewed here offer a reasonable range of programs at a fair price and can be recommended, particularly to new users. The best buy must now be the recent Games Tape 1 from a new source — Active



SURVEY
WARE

Software — which has taken some established ideas and implemented them beautifully using all of the Dragon's facilities cleverly. There are eight games, several of them as good as those offered elsewhere as individual cassettes.

In Interplanetary Trader you voyage the galaxy for blatant personal gain, dealing with the bank, and avoiding various perils, whilst keeping you ship in one piece.

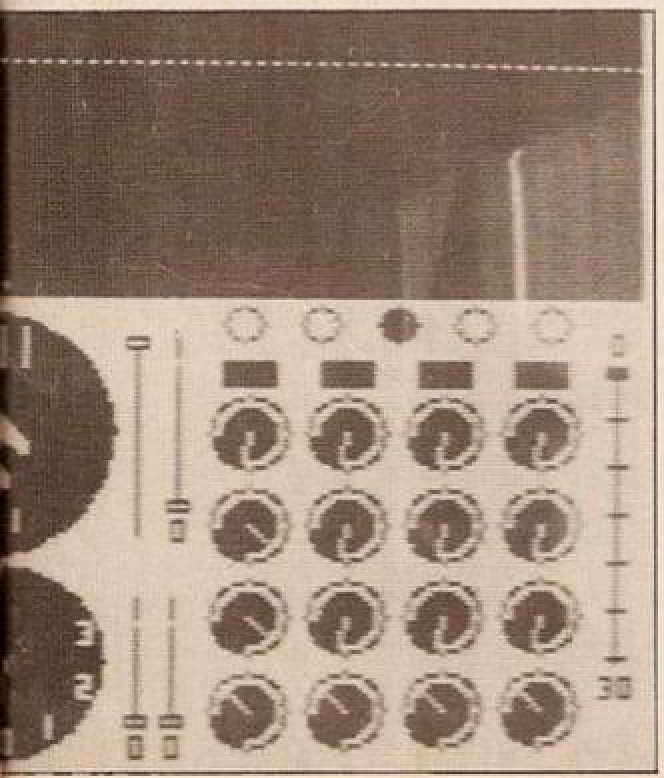
Execution is a colourful re-interpretaton of Hangman with a first-class moving high-resolution display of a firing squad in place of the scaffold, and a tuneful rendering of the Mexican Hat Dance. Wumpus Mansion is a game with two mazes, you travel the first seeking treasure and avoiding Wumpi — revolting things — and race through the second if you have the misfortune to trigger a time-bomb.

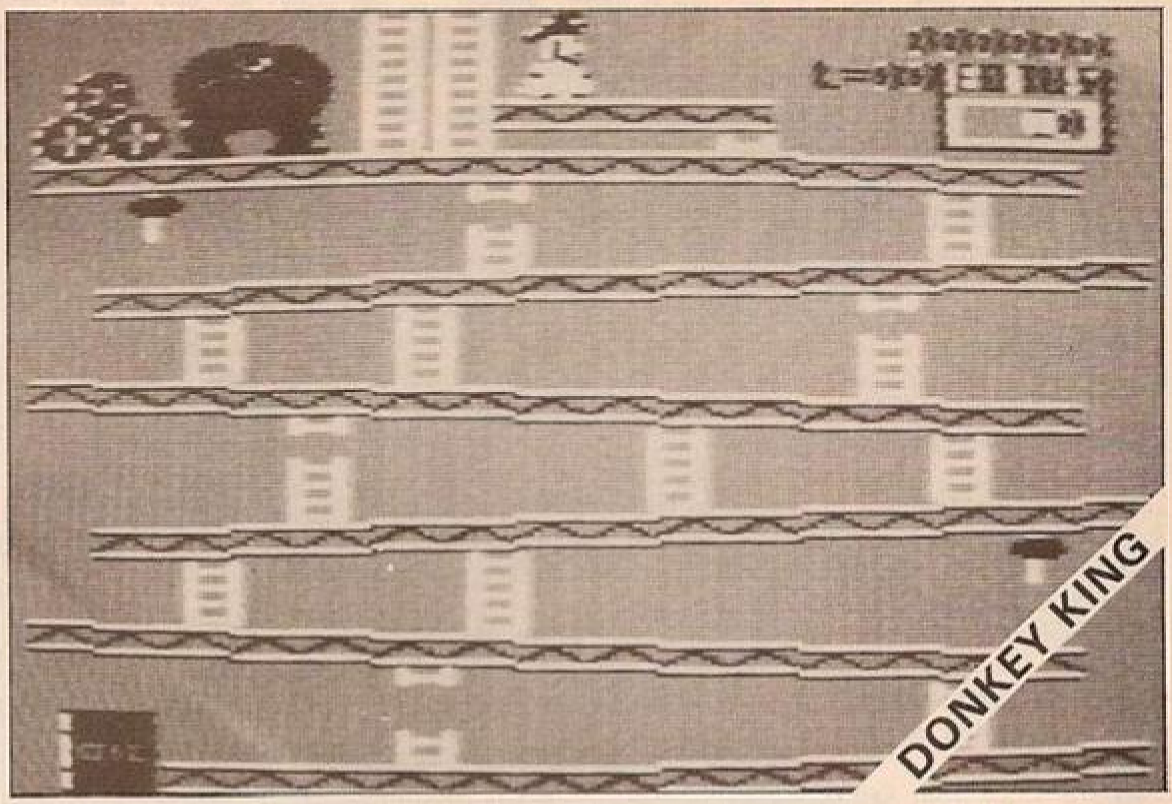
Wipeout is a variant of the old snake idea. You slither around the screen collecting items, but not crossing or going back on your track.

Hi-Lo is rather like "Play Your Cards Right" but has the advantage of doing without Bruce Forsyth. Snail's Pace makes a change from horse-racing, and Atom Hunt requires some brainwork, but Air Assault is just good old-fashioned aggression as you bomb the city to make enough room to land your helicopter.

A series of innovative family-orientated multi-player games come from Shards Software. Dragon Fun and Games is excellent for children's parties.

The first Gem Pack, from Gem Software, offers four games of skill, the second Gem Pack offers two skill games plus two strategy games, and the third complex versions of Reversi and Pontoon.





J C Morrison's tapes are excellent for your arcade games fans as they each contain three diverse and very fast machine-code programs. DGT2 contains Snakes, Lander and Invaders and DGT4 feature Pterodactyl, Torpedo Run and Hornet.

Garland Software has released physics and biology programs, which are particularly useful to schools. All programs use both text and graphics, repeatedly question the user on his knowledge, and allow any section to be repeated.

Useful animation is included in Action of the Heart — showing blood flow and electrical activity — and Principles of the DC Motor — especially the perspective view of a moving motor at the end — and the Ohm's Law program features a useful simulation of an experiment which requires you to take readings from the screen, checks your accuracy and plots a graph of your results.

The educational value of these programs is high and our only real criticism is the jump-back from the high-resolution pictures to the text screen when user input is required, which makes it more difficult to consider your answer.

Skill may mean different things but arcade games are the highest test of reaction and co-ordination. Microdeal has an extensive range of first-class machine-code look-alikes of all the favourites. Planet Invasion is very hard and if you are fed up with zapping and being zapped then try Donkey King: rescue the fair maiden from that maniac gorilla with the endless supply of barrels by jumping and hammering at the right moment.

The popularity of golf programs was a surprise — surely people play golf to get out in the fresh air, or is the 19th hole merely a substitute for the one-armed bandits?

The best — for the true golfer — is Salamander's. It closely approximates the actual game procedure, includes wind, sloping greens and an obvious thud when your trajectory ends in a bunker. The use of a movable aiming point rather than compass directions is particularly good. Apex offer a much cheaper and quite reasonable high-resolution alternative. For the non-golfer who just wants another game, or for youngsters, the low-resolution Handicap Golf from Computer Rentals is perhaps your cup of tee.

Grand Prix, from Salamander, allows one or two players to try their driving skill with the joystick on versions of all the major motor-racing circuits of the world, or if that is too easy what about flying a Jumbo Jet? 747 Simulator — from DACC — lets you try cold-start, warm-start and landing approach and has a very complex and realistic flight-deck display. Keeping control of the 747 is hard even without the occasional systems failures which were generated — I wonder what Boeing would have to say about this — and flying this program is a real simulation, rather than just another game.

Dragon slaying

Tenpin, by G Newman, was a reasonable simulation of bowling, including an accurate update of your score card on screen, but the ball was rather small and difficult to see. If you are stuck on the space theme UFO — Computer Rentals — allows you to pit your wits against 10 different types of alien ship and Luna Lander — St George Software — was quite difficult.

We nominated St George and the Dragon from Computer Rentals as the most original and amusing game. This is an animated graphics program in which you kill — or avoid — the fire-breathing dragon, cross a river, and smite a magic rock asunder with your sword to release the princess. Two versions were included, for joystick and cursor keys, the former being extremely difficult and the latter merely impossible. Killing the dragon is a cinch compared with balancing on the bridge and swimming with armour on.

If brainpower is your forte then consider the games of strategy. St George Software's Checkers was simple — and cheap — but still beat us, so what hope did we have against Salamander's three-dimensional Vulcan Noughts and Crosses. No wonder the latter has a zero player option where the machine tries to out-think itself as you sit back and watch in amazment. In MC Lothlorien's

(continued on next page)

(continued from previous page)

Samurai Warrior you have to weigh up which of your colleagues to fight to the death, but the graphics are rather slow and predictable. Tyrant of Athens, also by Lothlorien, is a better idea, representing the Hellenic Wars.

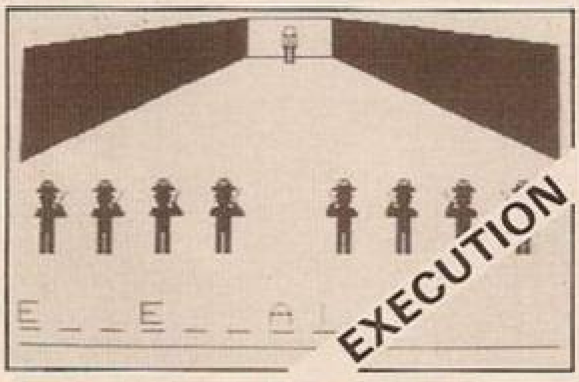
For those planning World War III there is the more complex Strategic Command from Romik where you build up and deploy your land and sea forces against the enemy. Keeping track of the entire disposition of your forces, and selecting targets, becomes difficult and we deplore the absence of an arms limitation conference option.

If money, rather than military might, takes your fancy then invite your friends in for a flutter at Charm Computer Software's Roulette, where the wheel stands still and the ball goes round, but the bank still wins. An alternative multi-player money game in Space Monopoly from Microdeal. You must select your outposts and make your investments with due regard to the possibilities of expansion and takeovers.

Wizard Wars from Salamander is a clever technological development of the old "Paper-stone-scissors" schoolyard game, in which teams of wizards select diabolical and protective spells as they battle to destroy each other. There is a whole book of complex spells with differing potencies, energy requirements, and possibilities of backfiring, to be learnt if you are to triumph.

An increasing range of Dragon utilities is appearing. Artist's Designer from S W Winter allows you to construct high-resolution drawings with ease and also to write text on the high-resolution screen. Character Generator — Gem Software — allows you to define your own high-resolution character set on a nine by seven matrix, and Save this for use elsewhere. It makes character definition easy and detailed written instructions are supplied, but in use text appears rather slowly as PSet rather than Draw is used. An interesting 3-D demonstration of the manipulation of an image in three-dimensions is included.

Micro Music Map, from Cotswold Computers, is a chart giving conversions from sheet music to Dragon Play format, particularly useful to non-musicians who wants to include tunes in the program.



Compusense's Demon — cartridge — and PSS's Dragbug — cassette — both provide monitors which allow you to inspect and modify memory and register contents so that you can create your own machine-code programs. As the main part of Demon resides in the cartridge area, little user memory is taken up and, whilst Dragbug includes a dis-assembler and a printer driver, Demon allows you to inspect memory in ASCII format, and include various monitor subroutines in your own programs. Demon also comes with clearer instructions, and is compatible with other software to be released by Compusense — including an editor-assembler. The dis-assembler from Rampage gives output of selected memory contents to screen and printer in standard 6809 mnemonics.

The two text-processors Telewriter from Microdeal, and Textstar from PSS, could both be used as word processors and indirectly, to produce and edit Basic programs with the benefit of a full-feature editor. In this application the value of the Dragon's "real" keyboard becomes particularly apparent. Both programs provide a useful range of text-handling facilities including full-screen editing, moves, search and replace, formatting, cassette saving and merging. Textstar also includes alpabetical and numerical sort, line and column display, and right justification, and is relatively inexpensive, but it uses the normal limited Dragon text screen and character set. As a real word processor Telewriter — U.S. transplant via Microdeal — is much more practical as it provides true upper and lower case characters on a black-on-white, 51 columns by 23 lines screen display. This accepts a wide range of printer control functions, block copy and delete, selective search and replace, word and line count, page-numbering, Verify, auto-retry during file search, partial Save and Print, queueing of

(continued on page 45)

Type	*Supplier*	*Players*	*Price*	*Originality*	*Accuracy*
Adventures					
Text only					
Orb	11	1	£5.00	**	—
Pharaoh's Curse	2	1	£4.95	**	—
Rescue from Death's Head Hole	25	1	£4.45	***	***
Taipan	12	1	£5.00	***	**
The Quest	11	1	£5.00	**	—
Graphics only					
Phantom Slayer	14	1	£8.00	****	—
3D Maze	11	1	£5.00	**	—
Text and Graphics					
Ring of Darkness	24	1	£10.00	*****	—
Star-Trek					
Dragon Trek	24	1	£6.99	—	****
Dragon Trek	20	1 J	£9.95	—	*****
Space Trek	23	1 O	£7.50	—	****
Star Trek	3	1	£6.50	—	**
Star Trek	11	1	£5.00	—	***
Star Trek III	22	1	£8.00	—	***
Compendia					
Dragon Family Programs	21	V	£6.00	****	—
Dragon Fun and Games	21	V	£6.00	****	—
Games Compendium	20	V	£7.95	***	—
Games Pack 1	10	V	£7.95	**	—
Games Pack 2	10	V	£7.95	**	—
Games Pack 3	10	V	£7.95	—	****
Games Tape 1	1	V	£5.75	*****	—
Dragon Games 2	15	1	£6.95	—	****
Dragon Games 4	15	1	£6.95	—	****
Educational					
Action of the heart	9	—	£11.00	***	****
Digestive system	9	—	£9.90	***	****
Ohm's Law	9	—	£9.00	*****	****
Principles of the DC motor	9	—		*****	****
Skill					
Defence	14	1 H	£8.00	—	****
Donkey King	14	1-2 J	£8.00	—	****
Dragon Space Mission	10	1	£7.95	—	***
Dragon Monster Mine	10	1	£7.95	—	***
Katerpillar	14	1 J	£8.00	—	****
Invaders Revenge	14	1-2 O	£8.00	—	****
Planet Invasion	14	1 J	£8.00	—	****
Scarfman	14	1 O	£8.00	—	****
Dragon Gold	10	1-2	£7.95	*	**
Golf	20	1-2	£7.95	****	*****
Golf	2	1-2	£4.95	**	***
Handicap Golf	6	1-2	£6.95	**	***
Grand Prix	20	1-2 J	£7.95	—	****
Luna Lander	22	1	£4.00	—	***
St George and the Dragon	6	1 O	£6.95	*****	—
Tenpin	16	1	£7.00	—	****
UFO	6	1 J	£6.95	—	***
747 Simulator	8	1 2J	£9.95	—	****
Strategy					
Checkers	22	1	£3.50	*	****
Roulette	4	1-9	£4.95	***	****
Samurai Warrior	13	1	£6.95	**	**
Space Monopoly	14	2-4	£8.00	****	***
Strategic Command	19	2 2J	£9.99	****	***
Tyrant of Athens	13	1	£6.95	**	***
Vulcan Noughts and Crosses	20	0-2	£7.95	***	—
Wizard War	20	2-9 2J	£7.95		
Utilities					
Artist's Designer	24	O	£6.99	**	—
Character Generator	10		£9.95	**	—
Demon	5		£18.40	****	—
Disassembler	18		£5.00	*	—
Dragbug	17		£9.95	**	—
Micro Music Map	7		£3.50	***	—
Telewriter	14		£50.00	*****	—
Textstar	17		£11.95	***	—
Threedee	22		£5.00	***	—

Table of games reviewed. J means joysticks required; O means joysticks are optional, and V means the number of players varies.

PLAY YOUR CARDS RIGHT



THE INTEGRAL EXPANSION SYSTEM FOR VIC-20

Congratulations for choosing one of the best home computers around. Unlike Commodore, we still think that the VIC 20 is great, and doesn't need replacing by a big brother. Here is the result of **careful design**, bearing in mind many similar products from **Commodore, Stack** and **Arfon:** an **integral expansion system** which is practical, reasonably priced and compatible with **Commodore products** and many others. The system features many **exclusive qualities** in addition to those of its competitors. It consists of 4 items, each of which may be purchased **separately** and used **independantly**.

- **3 SLOT MOTHERBOARD:** This is a simple box plugging straight into the VIC 20, providing support for various cartridges. It comes with a switch to **isolate** the **Super Expander** Cartridge from **Commodore**, a switch to simulate **games cartridges**, a **battery back up connector*** and there is also room for **8K of extra Ram** if required*.
- **A SPECIAL RAM CARTRIDGE:** This can be used instead of the **Commodore** cartridge, and offers 16K of extra RAM. A further 16K can also be added, giving 28159 bytes free for Basic and 8192 bytes free for machine code.
- **A SPECIAL EPROM CARTRIDGE:** This is designed to offer **access speed** of disk, **security** of **ROM** and **ease of use** with tapes. Basic programs and games cartridges can be copied into the Eprom cartridge and played back at any time.
- **A 40 column ROM:** This will be available towards mid-February. It will enhance the VIC display to **25 lines per 40 columns** and offer the facility of adding a **second processor** (Intel 8088).

THE MOST PRACTICAL SYSTEM FROM:

£ 19 .95

ONLY.



TECHNICAL SPECIFICATIONS

MOTHERBOARD: 3 × 22 way gold plated connectors. Accepts all **Commodore cartridges**. Accepts **Toshiba** 2016 or **Hitachi** 6116 CMOS Ram (qty: 4). **Write protect** switch fitted. **Mode switch** and **battery connector** fitted only when supplied with 8K Hitachi Ram.

- **SPECIAL RAM CARTRIDGE:** uses single 5V supply Dynamic Ram. **Transparent refresh** without slowing processor speed. **Access time:** 250ns maximum. **Capacity:** 16K or 32K bytes, addressed from $ 2000 — 7FFF and $A000 — BFFF. Switch fitted to partially disable any 8K memory block.
- **SPECIAL EPROM CARTRIDGE: Memory capacity:** up to 32K Eproms (4 × 2764s). Programs Eproms from **Basic** or **Machine code** programs or directly **copies** ready made cartridges. All saved programs have separate entry to the **Eprom catalog** (held in the first Eprom) and can be loaded back and run at any time. Addressed from $ 9800 — 9FFF and is compatible with all Commodore cartridges.
- **40 COLUMN ROM (ADVANCE INFORMATION ONLY):** 8K bytes. Can communicate with 2nd processor via 2K dual port Ram and interrupt.

Please note that each of the above products is normally available at your local computer store. You can also order them directly from us by mail or telephone. Thank you for the interest shown.

AUDIO-COMPUTERS

87 BOURNEMOUTH PARK ROAD,
SOUTHEND-ON-SEA — ESSEX SS5 2JJ
TELEPHONE: SOUTHEND (0702) 613081

THE INTEGRAL EXPANSION SYSTEM FOR VIC 20

SOLIDISK TECHNOLOGY LIMITED

87 Bournemouth Park Road, Southend-on-Sea, Essex. SS5 2JJ

Item	Qty	Price Inc VAT	Total
3 SLOT MOTHERBOARD		£19.95	
16K SPECIAL RAM CARTRIDGE		£34.95	
8K SPECIAL EPROM CARTRIDGE		£29.95	
8K EXTRA RAM (HITACHI) FOR MOTHERBOARD (OPTIONAL)		£19.50	
16K EXTRA RAM FOR RAM CARTRIDGE (OPTIONAL, to make 32K CARTRIDGE)		£11.95	
Post and packing		£1.00	£ 1.00

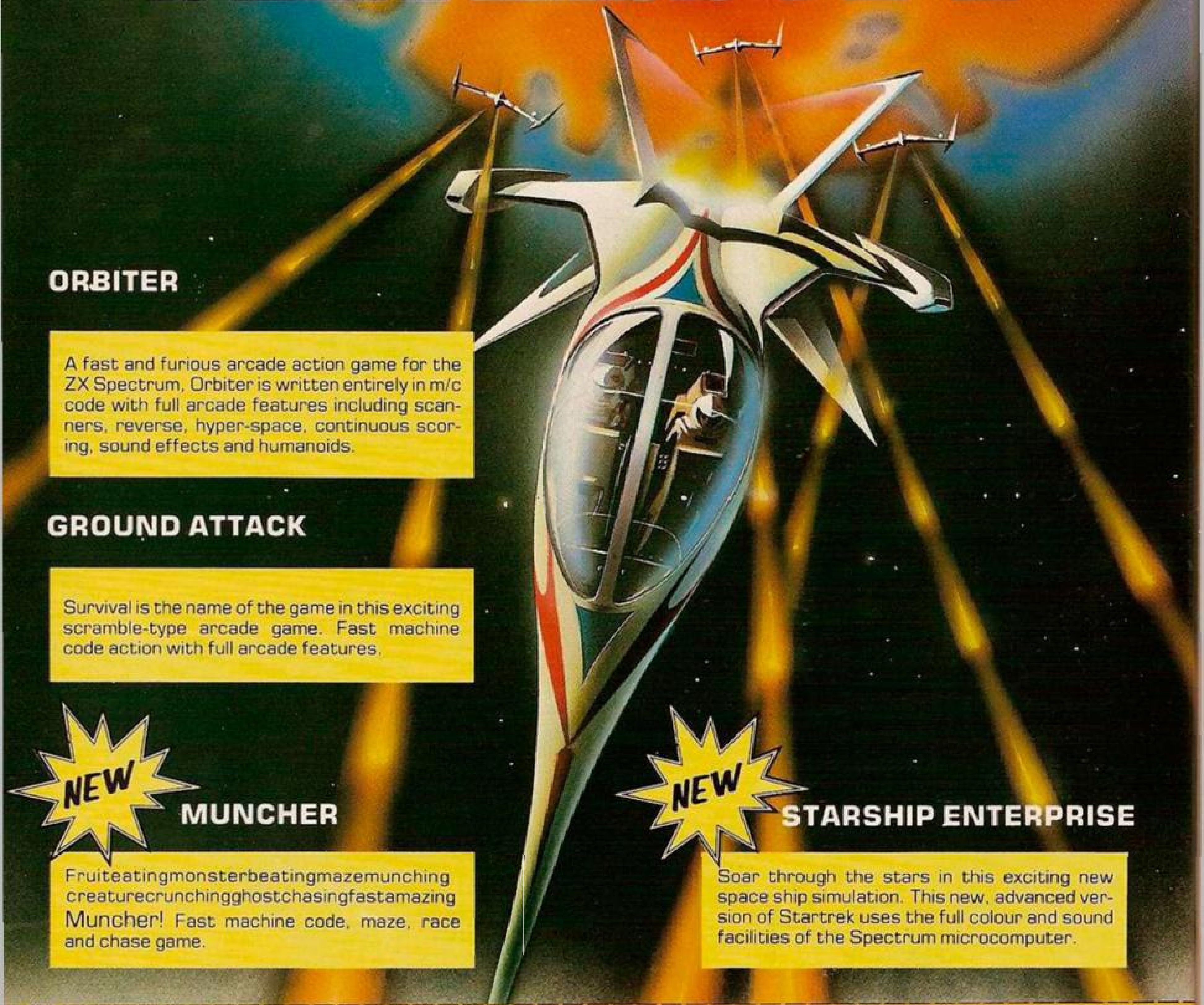
*Please delete/complete as applicable
*I enclose a cheque/P.O. payable to: SOLIDISK TECHNOLOGY LTD for £

Please charge my Access, Barclay account: TOTAL £

NAME

ADDRESS

SILVERSOFT



ORBITER

A fast and furious arcade action game for the ZX Spectrum, Orbiter is written entirely in m/c code with full arcade features including scanners, reverse, hyper-space, continuous scoring, sound effects and humanoids.

GROUND ATTACK

Survival is the name of the game in this exciting scramble-type arcade game. Fast machine code action with full arcade features.

NEW

MUNCHER

Fruiteatingmonsterbeatingmazemunching creaturecrunchingghostchasingfastamazing Muncher! Fast machine code, maze, race and chase game.

NEW

STARSHIP ENTERPRISE

Soar through the stars in this exciting new space ship simulation. This new, advanced version of Startrek uses the full colour and sound facilities of the Spectrum microcomputer.

ZX 81 Arcade Action List

ZX 81 Compiler	☐	£5.95
Muncher (ZX 81)	☐	£4.95
Asteroids	☐	£4.95
Invaders	☐	£3.95
Alien-dropout	☐	£3.95
Startrek	☐	£3.95
Graphic Golf	☐	£3.95
Super Wumpus	☐	£3.95
Games Pack 1	☐	£3.95

ZX – Spectrum Software

Orbiter	☐	£5.95
Ground Attack	☐	£5.95
Starship Enterprise	☐	£5.95
Muncher	☐	£5.95

GENEROUS DEALER DISCOUNTS AVAILABLE

SILVERSOFT
2 Hammersmith Broadway, London WC6

Please send me as indicated. I enclose a cheque/PO for £________

NAME________ ADDRESS ________

PROGRAMMERS. Tired of working for nothing, send your programs to SILVERSOFT for a speedy reply.

(continued from page 42)
cassette files for Print, and repeat headers. Cassette files are saved as very compact machine-code dumps rather than the extremely slow ASCII format used by Textstar.

Four different versions, optimised for different printers, are included, together with a conversion program for work on Basic programs. First-class documentation comprising a step by step tutorial and a reference manual are included and Telewriter represents excellent value as a word processor for the serious Dragon user which, at £50, looks very good in comparison with Wordcraft for the Vic-20.

CONCLUSIONS

- An excellent range of games software for the Dragon has emerged, at prices which compare well with material for competitive machines, and substantial offerings on the serious side are now appearing, all of which augurs well for the future of Dragon Data.
- Various rumours are circulating about hardware modifications, ROM bugs and RAM reconfiguration which can cause problems on some machine-code programs, so if you have a program that runs into difficulties consult your supplier.
- One point to watch when using programs one after the other is the last state of the reserved graphics pages. These can easily cause out-of-memory errors on the next program if you do not turn off between programs.
- A final word to small suppliers — please remember multiple copies are really no substitute for a decent recording. There is nothing so frustrating as a program that will not load. ■

Software suppliers. Numbers correspond with those given in the table of games reviewed.

1 Active Software, 32 Moors Lane, Northfield, Birmingham B31 1DH.
2 Apex Trading, 115 Crescent Drive South, Brighton BN2 6SB.
3 Barnsoft, 48 Waverley Road, Portsmouth, Hampshire.
4 Charm Computer Software, 243 Shirley Road, Acocks Green, Birmingham B27.
5 Compusense, PO Box 169, London N13 4HT.
6 Computer Rentals, 140 Whitechapel Road, London E1.
7 Cotswold Computers, Park Hill, Hook Norton, Oxfordshire.
8 DACC, 23 Waverley Road, Hinderley, Greater Manchester WN2 3BM.
9 Garland Computing, 35 Dean Hill, Plymouth PL9 9AF.
10 Gem Software, 22 Prestwick Drive, Bishop's Stortford, Hertfordshire CM23 5ES.
11 Impact Software, 70 Redford Avenue, Edinburgh EH13 0BW.
12 Jaysoft, 6 Wentworth Drive, Bishop's Stortford, Hertfordshire.
13 M C Lothlorien, 4 Granby Road, Cheadle Hume, Cheshire SK8 6LS.
14 Microdeal, Deal House, Luxylan, Bodmin, Cornwall PL30 5EF.
15 J Morrison Micros, 2 Glensdale Street, Leeds LS9 9JJ.
16 G Newman, 12 Malden Park, New Malden, Surrey.
17 PSS, 452 Stoney Stanton Road, Coventry CV6 5DG.
18 Rampage, 32 Birchwood Drive, Wilmington, Dartford, Kent DA2 7NE.
19 Romik Software, 24 Church Street, Slough SL1 1PT.
20 Salamander Software, 27 Ditchling Rise, Brighton, East Sussex BN1 4QI.
21 Shards Software, 10 Park Vale Court, Vine Way, Brentwood, Essex, CM14 4UR.
22 St George Software, 6 Storrsdale Road, Liverpool L18 7JZ.
23 Trojan Products, 166 Derlwyn, Dunvant, Swansea SA2 7PF.
24 S W Winter & Co, 101 Westminster Bridge Road, London SE1.
25 Words and Pictures, 7 Hawthorn Crescent, Burton-on-Trent DE15 9QP.

DRAGON SOFTWARE
FOR ALL THE FAMILY

FAMILY PROGRAMS . . . £6
- Strategic tank battle for 2 players.
- Educational maths quiz (3 levels).
- Guess the tune! (100 songs) 1/2 players.
- Comprehensive mortgage/savings calculator.
- Massive 750 question Quiz for 1/2 players.
- "Simon"-type memory game.
- "Day-of-week" calculator.
- Test your speed of reaction.
- "Chase the face" across the screen.
- Artists sketch pad.
- Thread the ring through the wire, 1-6 players.

FUN AND GAMES . . . £6
- Hi-res noughts and crosses (2 levels).
- Brain-teasing mastermind test.
- Race against time to collect the gold.
- Play card game, "Snap" against the Dragon.
- Unjumble the town name anagrams.
- Pin the tail to the donkey!
- Who can score the highest at poker dice.
- Pair up the coloured circles.
- Create and compare your computer art.
- Let the Dragon control your party games.

LIVE AND LEARN . . . £6
- Step-by-step tutorial, exploring the mysteries of High-resolution graphics.
- Facts and figures about favourite zoo animals with world map and a quiz.
- Educational tour of England, Scotland & Wales.
- Instructional quiz on towns and cities of Britain.
- How would you survive in a desert? Try the quiz, then learn the facts.
- Play your own tunes and learn about music notation.

CITY DEFENCE . . . £5 . . . exciting missile command arcade game for joystick. With good sound, colour and graphics

GENEROUS DEALER DISCOUNTS. SEND NOW FOR OUR STARTER PACK OFFER

HEAR WHAT THEY HAD TO SAY:
"Well thought out programs, made better by professional presentation and full use of Dragon facilities". Popular Computing Weekly *(FUN AND GAMES)*
"Very enjoyable, excellent quality". CG of Colchester *(FAMILY PROGRAMS)*

- 48 HOUR DESPATCH BY 1ST CLASS POST
- LIFE-TIME REPLACEMENT GUARANTEE
- AUTOMATIC MEMBERSHIP OF SHARDS USER CLUB (with discounts and newsletter)

SEND CHEQUES/POs To:
(Prices include P&P)

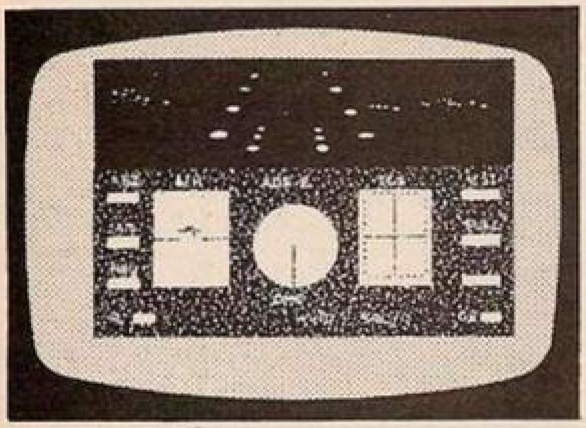
SHARDS SOFTWARE

At:
**10 PARK VALE COURT
VINE WAY, BRENTWOOD,
ESSEX CM14 4UR**

Hewson Consultants

We proudly announce our 1983 range of

SPECTRUM CASSETTES



NIGHTFLITE 16 and 48K FLIGHT SIMULATOR

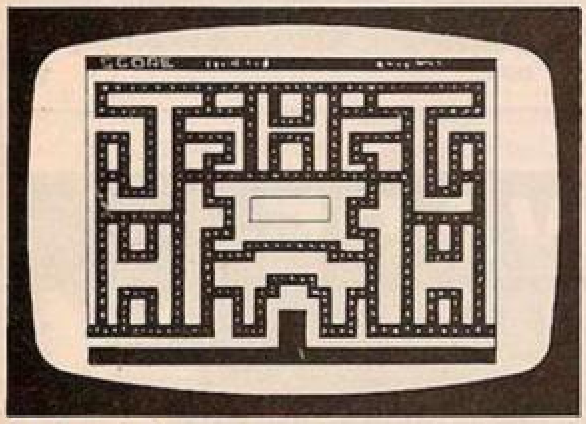
NIGHTFLITE puts you at the controls of a light aircraft flying at night. You can:
Climb, descend, take off,
Land, bank left or right,
Navigate between beacons,
Raise/lower the flaps,
Raise/lower the undercarriage,
Adjust engine rpm,
Raise/lower the nose varying amounts.
Runway lights appear on approach.
5 modes including Autopilot.
Written by a qualified light aircraft pilot.

A/H – artificial horizon
ALT – altitude in ft
HDG – heading in compass degrees
FL – flaps up/down
GR – gear up/down
VSI – vertical speed indicator
WIND – wind direction/velocity
DME – distance measure equipment
ADF – automatic direction finder
ILS – instrument landing system
VOR – VHF omni directional range

£5.95 our runaway best seller

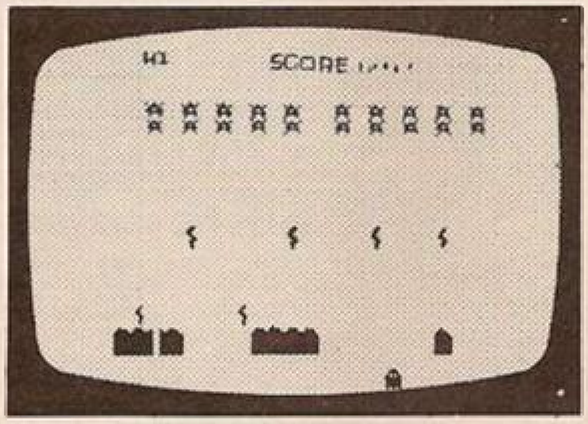
Available through W H SMITHS and many independent micro-computer shops

COMING SOON:– **AIR TRAFFIC CONTROL** – Puts you in command at Heathrow Airport **£5.95**



£5.95
All action game

£5.95
Are you fast enough?



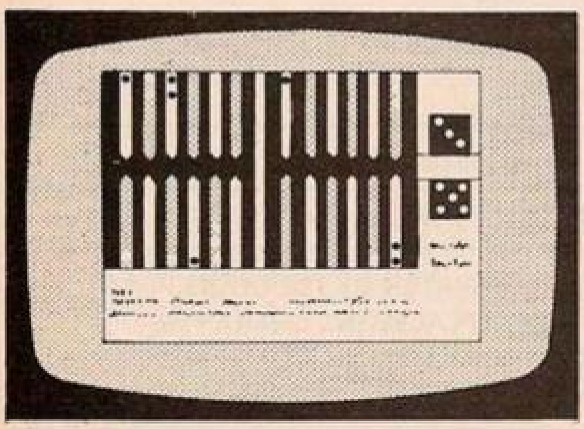
MAZE CHASE
16 and 48K

4 or 8 Mazes, Highest score to date,
4 independent guardians, 3 lives,
Full colour, Fast machine code action.

SPECVADERS 16K

Defeat each squadron of Beeple Zaps and another appears only closer. Cyrian mothership with ejecting Zeetle Baps.

5 levels of play from Orions snails pace to close your eyes and hope. Real time scoring. 3 lives. Pan galactic gargle blaster for highest score. Descending asteriods.



£5.95
A real challenge

£5.95
Another first



COUNTRIES OF THE WORLD

16 and 48K on one cassette
Countries of the world is an educational package designed to give an appreciation of the location of all the main countries and some information about them.
16K version displays a world map, shows the position of each country and names its capital.
48K version; all the above plus prints the population, size, currency, and main languages of each country, and statistics on largest and smallest countries etc.

BACKGAMMON 16K

8 Levels of play from novice to expert.
Full colour display of tables and dice.
Gamble on a single game or a series, double or quits. All the features of the ancient game.

Hewson Consultants
SPECTRUM BOOKS



40 BEST MACHINE CODE ROUTINES FOR THE ZX SPECTRUM — £5.95

By Andrew Hewson and John Hardman

Section A: Three chapters explaining what you need to know about Z80 machine code on the Spectrum.

- How to load and save machine code.
- How to use the system variables.
- How memory is organised.
- How program lines are stored.
- How to use the stack, the display, the attribute files.
- How to call ROM routines – where they are and what they do.
- The structure of Z80 code – plus a valuable glossary.

Section B: 40 routines including,

- Scroll – up, down, side to side by pixel or by character.
- Search and replace, token swap, string search.
- Rotate character, invert character – horizontally and vertically.
- Line renumber – including GOSUBs, GOTOs, RUN etc.

This book teaches the beginner all he needs to know in a simple, easy-to-learn form and its an invaluable reference work for the expert too!

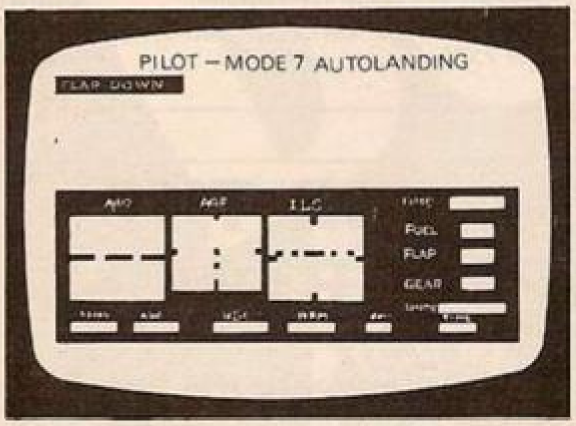
20 BEST PROGRAMS FOR THE ZX SPECTRUM — £5.95

By Andrew Hewson

Program titles include:
Machine Code Editor – Write, modify, extend and load machine code using this all-basic program. No need to use an Assembler when you have this program.
Index File – Learn about fixed length records, save numeric and string information, add to, sort, modify, delete and print your records. Ideal as a computer based filing system.
Duckshoot – Learn how to manipulate the attributes file *and* have fun at the same time.
Graphix – Construct up to 210 graphics characters with the full on-screen editing facilities, enhance and modify them and recall them later to build a detailed display to save on cassette.
Spiromania – A program to stretch your artistic talants, imagination and ingenuity. Draws a limitless variety of curves and spirals.
Plus: FOOTBALL, DIGITISER, DIARY and many more.

Available through Computer Bookshops and W H SMITH.

ZX81 BEST SELLERS



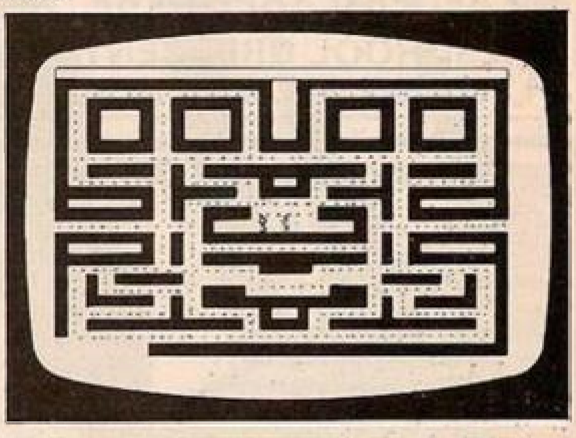
PILOT 16K (ZX81) £5.95

Fly your own aircraft.
Instruments:
Artificial Horizon,
Automatic Direction Finder,
Instrument Landing System.
Readouts:
RPM, Flaps, Heading etc.



HINTS & TIPS FOR THE ZX81 £3.95

Passing data between programmes,
Calling subroutines from cassette,
Machine code programmes.
Bits, bytes, addresses and hexodecimal plus much more.



PUCKMAN 16K (ZX81) £5.95

3 Mazes.
Highest score to date.
4 Independent guardians.
Magic strawberries.

RETAILERS

We are continually on the look out for new outlets. if you are interested in stocking the items advertised here, write to us for our trade rates.

URGENT

We require high quality Spectrum and Dragon software. Good royalties paid. Send your samples today for fast evaluation.

THE PROGRAMS

The programs advertised here are available from computer bookshops with a software stand, and many independent micro-computer shops.

ORDER FORM — Make cheques/PO's payable to Hewson Consultants — YC3

Quantity	Product	Cost

Name ______________________ Total ________
(Block Capitals Please)

Address ______________________

______________________ Signed ________

My Access/Barclaycard No. is ______________________

Post to: **HEWSON CONSULTANTS**, 60A St Mary's Street, Wallingford, Oxon OX10 0EL.
Tel (0491) 36307.

SEVERN SOFTWARE

SPECTRUM — ORIC — ZX81

ROADRUNNER

SPECTRUM 16K & 48K £4.95 inc.

Everyday from Monday to Friday Mr. McGoo gets in his car and drives home from the office. Mr. McGoo is such a lousy driver that he'll crash into anything that gets in his way!
The roads are full of Mr. McGoos. Can you get home from your office without becoming one of their victims?

- Ask for SEVERN SOFTWARE at your local Computer Shop.
- We guarantee to replace AT ONCE any cassette sold by us that fails to load on receipt.
- The exact software specification varies from machine to machine particularly with regard to sound and graphics.
- Dealer enquiries welcome.

Please send me ....
(Please state machine)
I enclose Cheque/P.O. for £ ....
Name ....
Address ....
.... Post Code ....

SEVERN SOFTWARE
5 SCHOOL CRESCENT,
LYDNEY, GLOS GL15 5TA

QUINCY

SPECTRUM 48K £5.95 inc.

Get the most from your Micro.

***A specially-commissioned version of that well-known 5-Dice game for 2-6 players, played and enjoyed by families world-wide.**

Why play alone when the whole family or a few friends can join in? This is not merely a game of chance.

You can only win by skilful playing.

Easy to learn but totally absorbing.

Features: —

- **Full colour and graphic game displays.**
- **Individual screen score cards.**
- **Dice control.**
- **Full choice of score card entries, based on individual strategy.**
- **Hold and Clear facilities for dice scores.**
- **Earn a bonus score.**
- **Save game facility.**

Become the QUINCY CHAMP in your house.

***Written by TONY CHURCHER.**

MORIA

SPECTRUM 16K & 48K	£4.95 inc.
ORIC 48K	£4.95 inc.
*ZX81-16K	£4.45inc.

A challenging graphic adventure set in the Mines of Moria. Can you survive encounters with the monsters of Middle-Earth? Will the Wizard help you? Are you fated to die beside the sealed doors? Or have you the power to open them? Unless you find Durin's Ring you will never leave the Mines alive!
A game to test your character.
Sound effects and save game and reset facilities.
*The ZX81 version displays each location. Collect treasure and find your way out.

GRAIL

SPECTRUM 16K & 48K	£4.95 inc.
ORIC 48K	£4.95 inc.
ZX81-16K	£4.45 inc.

Exciting graphic adventure. Where in the Castle Perilous is the Holy Grail? Gather armour and weapons to fight Monsters.
Sell treasure to a Trader.
Where will the Warp take you to?
Sound effects and save game facility (not on the ZX81 version).

r q FORTH BBC

"r q FORTH" runs on 16K or 32K BBC micros and costs £15. It:
* follows the FORTH-79 STANDARD and has fig-FORTH facilities;
* provides 260 FORTH words;
* is infinitely extensible;
* has a full-screen editor;
* allows full use of the M.O.S;
* permits use of all graphic modes, even 0-2 (just!);
* provides recursion easily;
* runs faster than BBC BASIC;
* needs no added hardware;
* includes a 70 page technical manual and a summary card;
* has hundreds of users.

FORTH TOOLKIT

Level 9 Computing are pleased to announce a new toolkit for "r q FORTH" on 32K BBC micros. It costs only £10 and adds the following facilities to FORTH:
* a 6502 assembler, providing machine-code within FORTH;
* turtle graphics, giving you easy-to-use colour graphics;
* decompiler routines, allowing the versatile examination of your compiled FORTH programs;
* the full double-number set;
* an example FORTH program and demonstrations of graphics;
* other useful routines.

nascom

Extension Basic . £15/£30 ROM
Adds 30 new keywords to BASIC
Compression Assembler 2 . £12
Small source + high speed

Asteroids .... m/c,g £7.90
Galaxy Invaders . m/c,g £5.90
Missile Defence . m/c,g £7.90
Super Gulp .... eb,g £4.90
5-games cassette . misc £5.90
(FULL RANGE IN CATALOGUE)

adventures
Spectrum BBC nascom

1) COLOSSAL ADVENTURE: The classic mainframe game "Adventure" with all the original treasures & creatures + 70 extra rooms.

2) ADVENTURE QUEST: Through forest, desert, mountains, caves, water, fire, moorland and swamp on an epic quest vs Tyranny.

3) DUNGEON ADVENTURE: The vast dungeons of the Demon Lord have survived His fall. Can you get to their treasures first?

Every Level 9 adventure has over 200 individually described locations and is packed with puzzles - a game can easily take months to complete. Only sophisticated compression techniques can squeeze so much in! Each game needs 32K and costs £9.90

ALL PRICES INCLUDE P&P AND VAT - THERE ARE NO EXTRAS. Please send order or SAE for catalogue, describing your micro, to:

LEVEL 9 COMPUTING
Dept Y, 229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

PASCAL FOR THE ZX SPECTRUM

Hisoft are pleased to announce the availability of Hisoft Pascal 4 for the 48K ZX SPECTRUM.

No longer do you have to put up with the slow execution speed of BASIC programs; Hisoft Pascal 4 produces programs that run between 40 and 100 (yes 100!) times faster than the equivalent programs written in ZX SPECTRUM BASIC. For example, a program to sort a 100 element array of numbers into ascending order takes 60 seconds in BASIC, while HP4 produces a program which does the same thing in 0.6 seconds!

NOW you and your children can learn to program in an efficient and structured way by using Pascal, the favoured language in schools and universities.

NOW you can write games programs etc. which run as fast as you need them to without having to resort to assembler or machine code.

NOW you can use a language which requires minimal re-learning when you move from your SPECTRUM to another computer; Hisoft Pascal 4 has all the essential features of Standard Pascal as detailed in the Pascal User Manual and Report — by Kathleen Jensen and Niklaus Wirth, the man who designed Pascal.

Hisoft Pascal 4 is a professional piece of software designed by a team who have been writing Pascal compilers for many years — you will find it to be powerful, flexible and very easy to use.

To top it all, we are offering the package (which includes a 60 page manual), for a limited time, to 48K ZX SPECTRUM users at an INCREDIBLE price of:

ONLY £25 INCLUSIVE

STOP PRESS: DEV PAC, our powerful assembler, disassembler and debugger package is now available. Only £12.50 inclusive.

Write for more details TODAY to:

HISOFT
60 Hallam Moor
Liden SWINDON
SN3 6LS

Tel. (0793) 26616 (Answering machine)



DRAGON OWNERS
BARRELS OF FUN IN THE NEW
ANOTHER GREAT GAME FROM MICRODEAL – GUARANTEED TO KEEP YOU PLAYING FOR HOURS TRYING TO SAVE THE BEAUTY FROM THE BEAST. ROLLING BARRELS! KILLER FLAMES! LADDERS AND RAMPS TO NEGOTIATE IN THE BEST GAME EVER FOR THE DRAGON 32 HOME COMPUTER.
DONKEY KING
FROM TOM MIX
NEW
DONKEY KING
MICRODEAL
NEW
Katerpillar Attack
Planet Invasion
SPACE WAR
Defense
Scarfman
DRAGON INVADERS
ALCATRAZ II
Flipper
ESCAPE
SPACE MONOPOLY
MANSION ADVENTURE 1
Jerusalem ADVENTURE 2
Williamsburg ADVENTURE 3
ULTIMATE adventure 4
All Cassettes £8 each (including VAT & Postage)
AVAILABLE FROM DRAGON 32 DEALERS NATIONWIDE OR ORDER DIRECT FROM:
MICRODEAL
41 TRURO ROAD, ST. AUSTELL, CORNWALL PL25 5JE TEL 0726-67676
Send 1st Class Stamp for FREE Software Lists for Dragon and Tandy range of Computers.
AVAILABLE FROM SELECTED Boots & John Menzies STORES

Watch out there's a robot about. The BBC Buggy is not alone. From £30 to £2,500 the robots are ready to move into your home.



The Buggy's only competition comes from the Japanese toy industry and infant American domestic robot industry.

Tomy's Robo 1 was the star of the British Toy Fair at Earl's Court. A toy version of an industrial robot arm, it is battery run and controlled by two joysticks at the base. The arm itself can be swung up and down through 180 degrees and turn 360 degrees horizontally. Further dexterity is provided by the wrist which can swivel in almost any direction. By controlling the Robo 1's claw hand the operator can grip, pick up, rotate, move and release objects with remarkable precision. This is a well constructed and absorbing toy which sells for just £30.

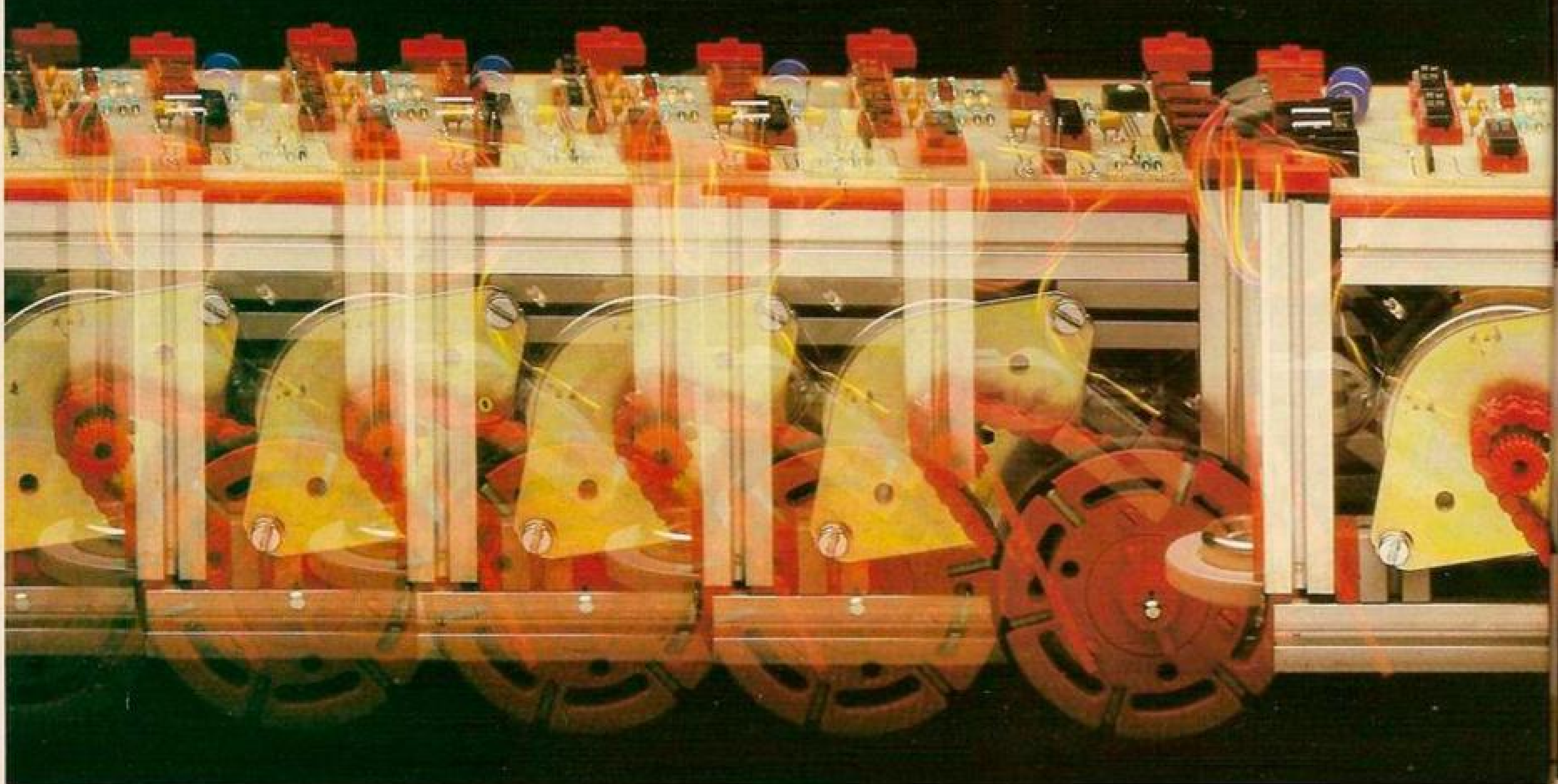
Like the Buggy the Hero-1 is a programmable three-wheeled vehicle driven by two stepper motors and sold in kit form. Looking like a cross between Dr Who's K9 and Star Wars R2D2 it more closely conforms to the popular idea of a robot. Unlike the Buggy the Hero-1 is self-contained with an on-board microprocessor and its own battery power supply. It uses a 6808 processor with 4K RAM and 8K ROM. Instructions are entered via a hexadecimal keypad.

The Hero-1's range of sensors is far more extensive than the Buggy's. As well as a light detector it has detectors which can sense sound, motion and distance. It uses a sonar system to work out the distance of objects within a range of eight feet. There is also a built-in clock and options for a speech synthesiser and gripper arm.

This is obviously a more sophisticated package than the Buggy and a much more expensive one. In the U.S.A. the Hero-1 robot kit sells for $1,000 without the arm and speech synthesiser. Heath Electronics U.K. will be launching a fully-assembled version including the arm and synthesiser for £2,455



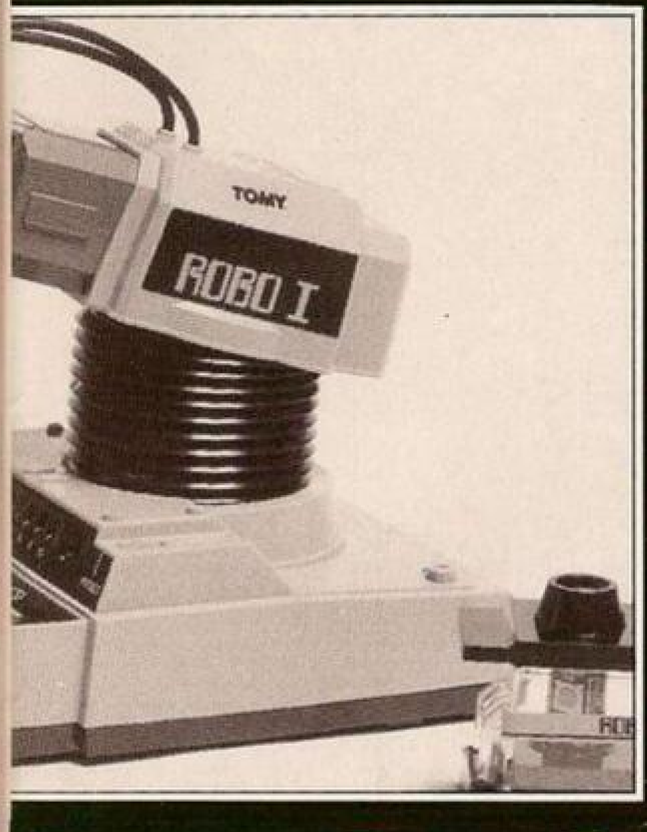
MARCH OF THE RO



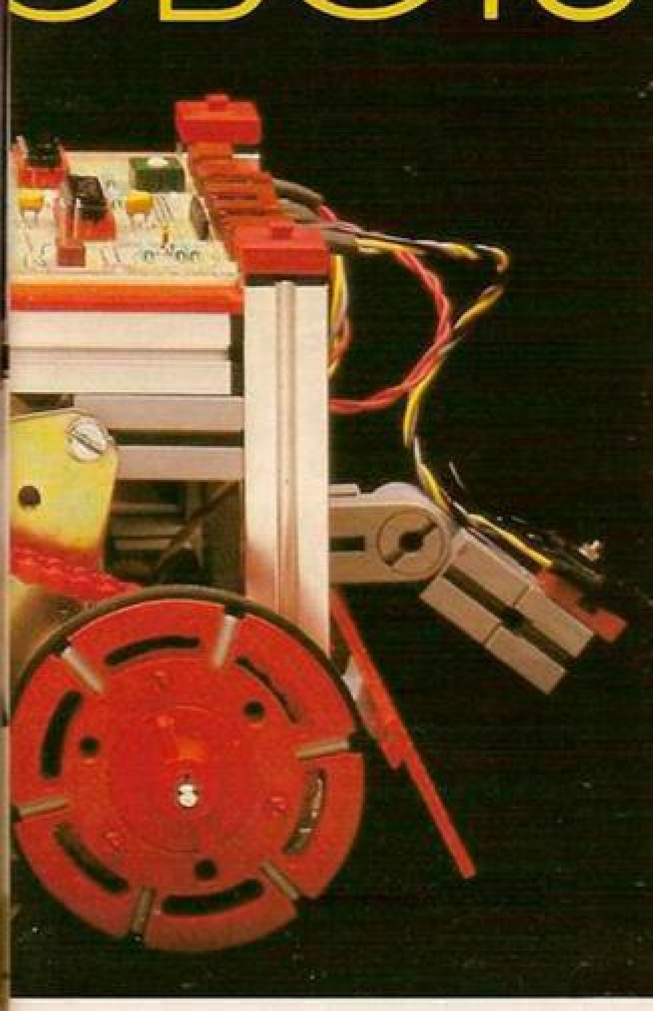
REVIEW

which will be available later this month.

But in some ways the Buggy offers the user greater scope for exploring robotics. It is easier to program and the BBC Microcomputer allows for more versatile software applications than the Hero-1's on-board computer.



OBOTS



Designed for the home. Built by screwdriver. Tested by Simon Beesley. Buggy — the world's first affordable robot.

BBC BUGGY

IF YOU HAVE grown tired of all those video games and have exhausted your machine's programming potential you can now revive your interest in computing with the BBC Buggy. This is a three-wheeled vehicle which can be controlled by a BBC Micro and programmed to move in any direction, detect collisions, detect light, read a bar-code, and operate a pen-up/pen-down mechanism. In short it is a robot — and at around £120 it is the first to come within the range of the home computer user rather than the electronics hobbyist.

The Buggy is the fruit of a collaboration between the BBC Computer Literacy Project and the Microelectronics Education Programme. After discussing ideas for the BBC's *Making the Most of the Micro* series with producer David Allen, Mike Bostock, Technology Manager for the MEP, built a prototype Buggy using Lego bricks. "Everyone wants to build a robot", he says, "and at the age of 33 I finally built one".

When the Buggy goes on sale this month it will come as a construction kit containing a chassis, two stepper motors, three types of sensor, control cables and electronic circuit boards. To go with it there is a tape with 13 programs, documentation, a Buggy handbook and assembly instructions.

Fortunately the review robot arrived ready-built so we did not need to test the claims of Buggy-maker Economatics that the kit can be easily assembled in about two and a half hours using only a screwdriver.

The main body of the vehicle is a five-inch cube driven by two stepper motors which turn the front wheels. At the back there is a ball-bearing which acts as a balance wheel for the vehicle.

Using stepper motors greatly simplifies steering the Buggy since the motor can only be advanced by a fixed step at a time. This allows precise control of the vehicle's movement. Each motor has independent control over its respective wheel and the gearing is such that a single pulse to the motors rotates the Buggy by one degree.

It is comparatively easy to send the Buggy a specified distance forwards or backwards, or rotate it through any given angle. The two motors drive the vehicle at a rather stately pace with sufficient power for it to authoritatively brush aside obstacles such as books, in bulldozer fashion.

Top speed was measured at one and half miles per hour — hardly enough to trouble the man with the red flag. At the front is a split bumper with left and right microswitch collision detectors and above it a light detector — LDR. There is also a bar-code reader — BCR — mounted on a hinged arm which extends between the bumper and the LDR.

This consists of an infra-red light-emitting diode — LED — and photo-diode which respectively send out and receive infra-red light. The BCR detects a black line by measuring the amount of light it reflects. My only criticism of the vehicle's design is that the BCR arm is inconveniently positioned. Although it can fold back it tends to prevent the bumpers below from registering a head-on collision.

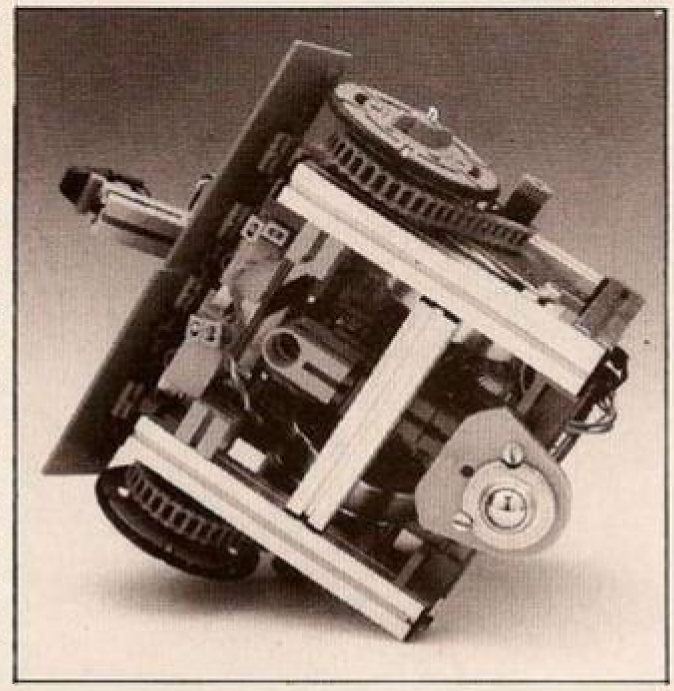
Logo-style turtle

In the Buggy's centre of rotation there is a pen-up, pen-down mechanism which is mounted on the centre axle and controlled by an electro-magnet. This will permit the Buggy to be used as a Logo-style turtle. It is not quite as accurate as a dedicated Logo turtle but is £180 cheaper.

On the BBC Micro the Buggy is controlled through the user and analogue-in ports. Both the LDR and BCR return an anologue input proportional to the intensity of light measured. The collision detectors send a digital on/off signal to the user port.

Each of the user port's eight bits provides a control line. Four of the lines from the user

(continued on page 53)



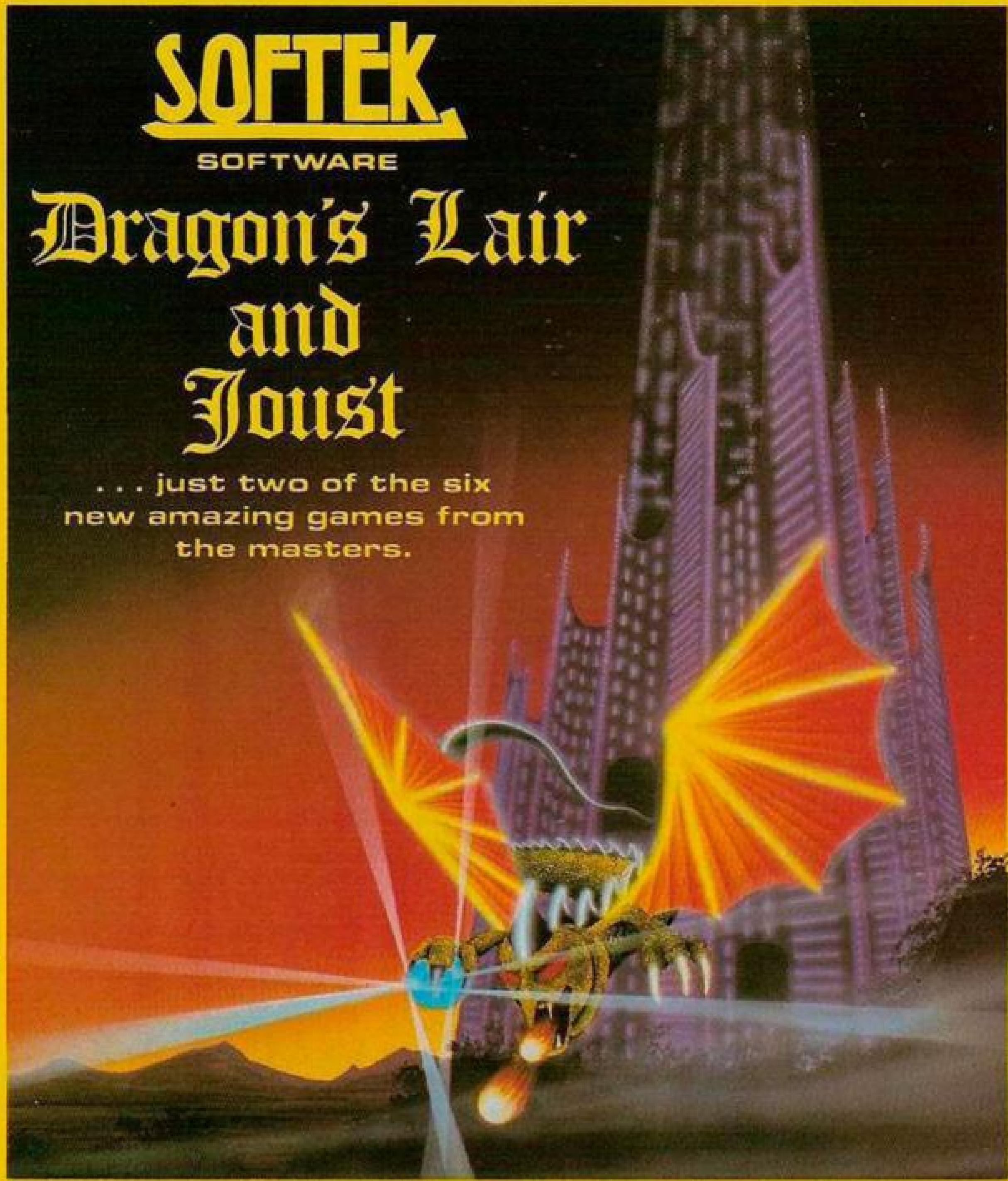
Dragon's Lair

I thought it would be easy . . . explore the Dragon's Lair and find the Crystal of Power with which to destroy him. But I didn't count on the dangers that confronted me. There were others in that mind boggling maze too!

The Ultimate 3D Maze-Adventure, for the 48K ZX Spectrum.

Joust

It's taken America by storm — now it's available for your ZX Spectrum! In this amazing new arcade game you Joust with the Dark Lords in an other-worldly setting. Quite amazing animation as you fly your Ostrich by controlling the flap of its wings! By Andrew 'Orbiter' Glaister



MONSTERS IN HELL

It was like a nightmare. Trapped in Hell, the all consuming flames below me, running from the Vampire monsters through a maze of platforms and ladders. I had Holy Power on my side, though, and could survive if I replenished it frequently. And the only way to kill them was to make them fall through holes I created with my hammer. But then the Mad Monk sent his ghouls after me . . . Any ZX Spectrum. By Mark Lewis

COSMIC SWARM

OK, I accept I'm to blame. I disregarded orders and entered the Altair sector. Eggs, eggs, everywhere — I shoot, two fantastical alien types appear, whose touch is deadly! They join, seemingly by chance, into a mutant which chases me! Probably the most original new space 'shoot-em-up' game to appear. Any ZX Spectrumn. By Andrew Beale

MILLIPEDE

Milli the Millipede seemed indestructible; no matter how much of her body I shot away she kept coming! But then Sid the Spider appeared from nowhere, and Scorpi zoomed across dropping her indestructible fleas on me! A quite astounding version of the arcade favourite. £5.95. By Andrew Blake

FIREBIRDS

They swoop, they dodge, they loop figures of eight! Can you survive the Firebirds' attack? Amazing hi-res machine code action from the Masters. Any ZX Spectrum. By Graham Devine

ALSO AVAILABLE
And you can still obtain our outstanding Meteorids, still the best available, or our Zolan Adventure, still the only truly playable 16K Adventure!

EACH GAME JUST £5.95

including VAT, Postage and UNCONDITIONAL GUARANTEE. ALL GAMES IN 100% MACHINE CODE. Available from all good shops, or if they are out of stock, direct from us by return of post — please make out your cheque/P.O. to Softek.

SOFTEK SOFTWARE

329 Croxted Road, London SE24

ZX SPECTRUM SOFTWARE

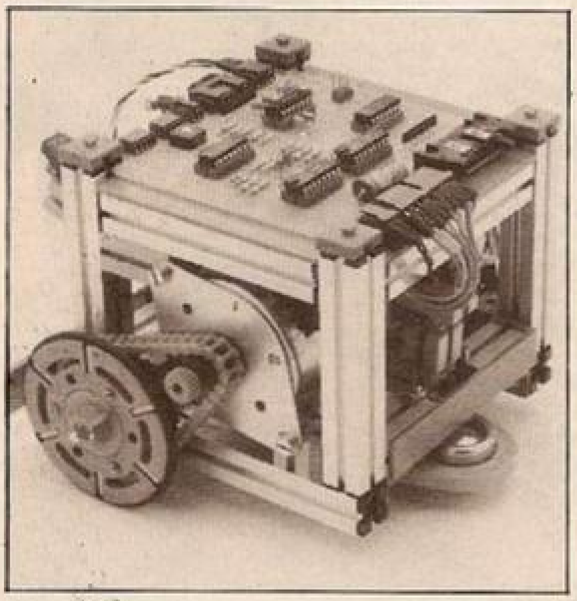
(continued from page 51)
port are used to control the stepper motors; one bit is used to turn on and off the electromagnet for the pen-up, pen-down mechanism, and two further bits are allocated to register the left and right collision switches.

I was pleasantly surprised at how easy it was to write controlling software for the Buggy. Once I found out how to write to and read from the user port it did not take long to write a short program to steer the Buggy from the keyboard, detect collisions and operate the pen.

Although the Buggy only runs on a BBC Micro at present, it should be possible to drive it from any micro with an eight-bit parallel port. Machines without analogue ports would be at a disadvantage and would require additional hardware to give the light sensors an on/off reading. Economatics is contemplating adapting the Buggy for the two machines on the DoI's list of recommended micros for schools — the Spectrum and Research Machines 380Z.

A robot can be described as an artificial intelligence in an artificial body. While the vehicle itself provides the body the BBC Micro or rather the programs it can run supply the intelligence. Along with the electronics and ironmongery almost 100K of software is supplied with the kit. The programs are graded and designed to take the user step by step up the artificial intelligence ladder.

In the process they show how a computer



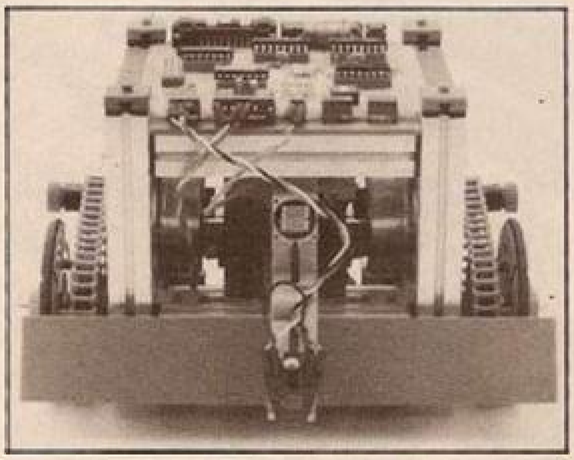
can be used with a robot as a switching device, a memory, a graphics terminal, a programmable device, an information processor and a problem solving unit. Since they demonstrate what the Buggy is capable of they are worth describing in some detail.

Test, the first program, checks that the Buggy is correctly set up and enables the user to test the sensors, displaying their input on the screen. This is followed by Switch, a short program, which lets you drive the Buggy in any direction by pressing the cursor keys. The vehicle is quick to respond and can be readily steered hither and thither.

As an advance on this facility Memory Switch records the key presses and can replay them in their sequence or in reverse order. This demonstrates how precisely the Buggy's movement can be controlled sending the Buggy along quite a complicated route several metres long and then commanding it to return, bringing it back to within a few centimetres of its starting position.

Recorder draws a map on the screen of the Buggy's progress while giving readouts of its position in an instrument panel below the map. Collisions are registered with a convincing crashing sound. Snail likewise plots the Buggy's path but also allows you to give it a coded sequence of instructions first, such as R30 or F50 meaning Turn Right 30 degrees or Go Forward 50 centimetres.

There are two programs which show how the Buggy can read in quite complex information from bar-codes. In Tin Pan Alley it reads musical information from a line of bar-codes, plays the tune and displays an animated score on the screen. Bar-Code Route Planner



instructs the Buggy to follow route instructions given on bar-code cards.

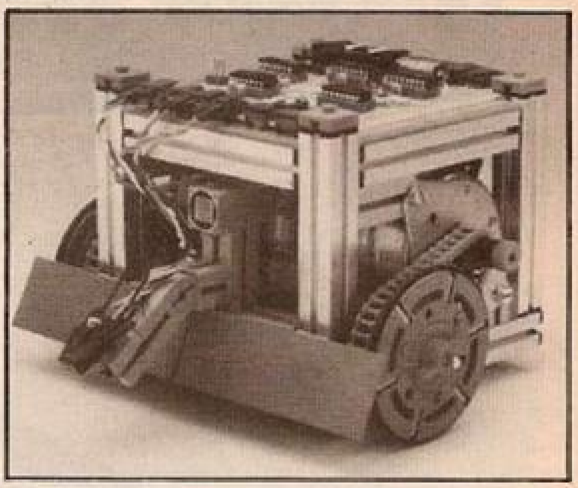
The remaining programs, in which the robot appears to act under its own control, demonstrate some of the principles of artificial intelligence. The Buggy is instructed to perform such tasks as seeking out an object and working out its size, following a black or white line, and measuring an enclosed area. Sunseeker programs the robot to track down a light source.

Once it has located its goal it homes in negotiating any objects in its way. Man versus Buggy requires the user to perform the same task — to drive the Buggy from the keyboard using the same information as is available to the computer which it presents on an instrument panel.

As soon as the vehicle starts to move in a purposeful manner it is difficult not to ascribe intelligence to its behaviour. One of the Buggy's predecessors, Dr Grey Walter's tortoise was a three-wheeled vehicle which could travel around a room avoiding obstacles. It was programmed to look for a power point to plug itself into and recharge its batteries when they ran low. Onlookers tended to feel empathy with it in its quest. The Buggy can provoke a similar response. It is bound to be a success in schools.

The 13 programs in the software kit are written in Basic and the procedures they contain can be incorporated in the user's own programs. There is clearly scope for more advanced artificial intelligence applications.

People who saw the Buggy on the BBC's *Making the Most of the Micro* series will have seen it finding its way around a maze until it reached a light source at the end and then returned to the start. If the robot were fitted with a grab-arm it could for example be programmed to demonstrate the principles of



the computerised warehouse. It would use the BCR to follow a line to a set of pigeon holes, then locate a pigeon hole which had been lit up, remove an item with a grab-arm, read its bar codes and use the information given to docket it elsewhere.

A grab-arm is one of the hardware expansions Economatics is considering. Other possibilities could be in the form of extra sensors such as a proximity detector or a heat detector.

The MEP stresses that the robot should not be seen just as a toy. But the term toy need not be applied dismissively. After all for most owners' home computers have no practical application and could be described as adult toys. Whether or not everyone wants to build a robot, the idea of controlling a robot exerts a fascination for most people. The Buggy's inventor Mike Bostock frankly describes it as "modern day Meccano."

People are not so much interested in the practical role of robots as uncomplaining drudges capable of performing menial tasks, as in their ability to carry out more complex and intricate routines. Linking the Buggy to the BBC Micro gives it considerable potential for such exercises in artificial intelligence.

The MEP which developed the Buggy sees it as finding a place in both the home and school. Andrew Hopkins who has written the manual describes it as one solution to the problem of introducing more technology into the curriculum. Whatever its application the Buggy is certainly enjoyable to play with as well being a useful introduction to control technology and artificial intelligence.

CONCLUSIONS

- The Buggy may not be able to do the washing-up or the housework for you but it can provide an excellent introduction to robotics and control technology.
- As an educational device which has its place in many different parts of the curriculum the Buggy should be very popular. It is fun to use and easy to operate. Its low cost also puts it within the reach of home computer users who are interested in robots.
- The Buggy's capabilities are well demonstrated by the 13 programs which accompany it. These do not exhaust its possibilities and there is plenty of scope for a variety of more complicated applications. ■

WORLD'S LARGEST LIST OF



Market your own software through us
Write with details

SOFTWARE (All prices include VAT)

Code	Item	Supplier	Price
MMS001	OPTIONS TIMETABLE (C)	(A.J. VISION)	£18.40
MMS002	RECORD CHANGER	(A.J. VISION)	£23.00
MMS003	WORD PROCESSOR	(A.J. VISION)	£18.40
MMS004	EDUCATIONAL—1	(GOLEM)	£ 9.25
MMS005	COLOSSAL ADVENTURE	(LEVEL 9)	£11.38
MMS006	ADVENTURE QUEST	(LEVEL 9)	£11.38
MMS007	DUNGEON ADVENTURE	(LEVEL 9)	£11.38
MMS008	STARSPELL	(FISHER MARRIOTT)	£11.50
MMS009	TABLE STAR	(FISHER MARRIOTT)	£11.50
MMS010	EARLY WARNING	(A & F SOFTWARE)	£6.90
MMS011	ROADRUNNER	(A & F SOFTWARE)	£6.90
MMS012	PLANES	(A & F SOFTWARE)	£7.99
MMS013	PHARAOHS TOMB	(A & F SOFTWARE)	£7.99
MMS014	FROGGER	(A & F SOFTWARE)	£7.99
MMS015	LUNAR LANDER	(A & F SOFTWARE)	£6.90
MMS016	TOWER OF ALTOS	(A & F SOFTWARE)	£6.90
MMS017	MAZE INVADERS	(PROGRAM POWER)	£5.69
MMS018	FOOTER	(PROGRAM POWER)	£7.99
MMS019	GOMOKO	(PROGRAM POWER)	£4.54
MMS020	MUNCHYMAN	(PROGRAM POWER)	£6.84

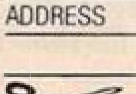


HARDWARE (All prices include VAT)

Code	Item	Supplier	Price
MMB01	BBC MODEL B	(ACORN)	£ 399.00
MMB02	BBC MODEL B + ECONET	(ACORN)	£ 446.00
MMB03	BBC MODEL B + ECON/DISK INT	(ACORN)	£ 516.00
MMB04	BBC MODEL B + DISK INTERFACE	(ACORN)	£ 469.00
MMB05	BBC MODEL A	(ACORN)	£ 299.00
MMB06	BBC MODEL A + ECONET	(ACORN)	£ 346.00
MMB07	BBC DISK DRIVE 100K	(ACORN)	£ 265.00
MMB08	BBC DISK DRIVE 800K	(ACORN)	£ 918.85
MMB09	BBC DISK INTERFACE	(ACORN)	£ 109.25
MMB10	BBC 6502 2nd PROCESSOR	(ACORN)	£ 195.50
MMB11	BBC Z80 2nd PROCESSOR	(ACORN)	£ 195.50
MMB12	TELETEXT RECEIVER	(ACORN)	£ 225.00
MMB14	JOYSTICKS (PAIR)	(ACORN)	£ 13.00
MMB15	RGB COLOUR MONITOR M/RES	(MICROVITEC)	£ 287.50
MMB16	RGB COLOUR MONITOR H/RES	(MICROVITEC)	£ 632.50
MMB17	RGB CABLE	(MICRO MAN)	£ 5.75
MMB18	12" GREEN MONITOR	(PRINCE)	£ 99.00
MMB19	12" AMBER MONITOR	(PRINCE)	£ 115.75
MMB20	PLINTH FOR RGB MONITOR	(MICROVITEC)	£ 8.96
MMB21	A TO B UPGRADE (FITTED)	(ACORN)	£ 115.00
MMB22	A TO B UPGRADE (KIT)	(ACORN)	£ 59.80
MMB23	MEMORY UPGRADE (KIT)	(ACORN)	£ 24.72
MMB24	PRINTER I/O (KIT)	(ACORN)	£ 8.74
MMB25	ANALOGUE (KIT)	(ACORN)	£ 8.74
MMB26	SERIAL I/O & RGB (KIT)	(ACORN)	£ 11.79
MMB27	EXPANSION BUS (KIT)	(ACORN)	£ 6.84
MMB28	PARALLEL CABLE ASSEMBLED	(MICRO MAN)	£ 15.00
MMB29	USER PORT CONNECTOR/CABLE	(MICRO MAN)	£2.30
MMB30	ANALOGUE PLUG & CABLE	(MICRO MAN)	£2.58
MMB31	5 PIN DIN	(MICRO MAN)	£0.69
MMB32	6 PIN DIN	(MICRO MAN)	£0.69
MMB33	7 PIN DIN	(MICRO MAN)	£0.69
MMB34	BUS CONNECTOR	(MICRO MAN)	£4.03
MMB35	EPSON MX80 FT///	(EPSON)	£373.75
MMB79	EPSON RX 80	(EPSON)	POA
MMB80	EPSON FX 80 160 CPS	(EPSON)	£454.25
MMB36	EPSON MX100	(EPSON)	£ 488.75
MMB37	SEIKOSHA GP100		£ 215.00
MMB38	SMITH CORONA D/WHEEL	(SMITH COR)	£ 511.75
MMB39	SPARK JET PRINTER	(ACORN)	£ 419.75
MMB40	TEC STARWRITER	(TEC)	£1265.00
MMB41	5¼" DISKS (10)		22.43
MMB42	COMPUTER CASSETTE TAPES		£ 1.00
MMB43	COMPUTER DUST COVER	(MICRO MAN)	£ 5.74
MMB44	DISK DRIVE DUST COVER	(MICRO MAN)	£ 5.74
MMB45	CASSETTE RECORDER		£ 29.00
MMB46	FLOWCHART STENCIL		£ 4.02
MMB47	DISK LIBRARY CASE		£ 2.87
MMB48	PAPER LISTING BINDER	(ACCO)	£ 2.87
MMB49	PAPER 9½ · 11" (2000)		£ 14.95
MMB50	GRAPHICS TABLET (CASS'E)		£ 86.25
MMB51	GRAPHICS TABLET (DISK)	(MICRO MAN)	£ 143.75
MMB52	LIGHT PEN	(MICRO MAN)	£ 34.50
MMB53	A/D CONVERTOR	(MICRO MAN)	£ 38.23
MMB54	128 K RAM PACK	(MICRO MAN)	£ 343.85
MMB55	COOLING FAN	(MICRO MAN)	£ 38.24
MMB56	DISK DRIVE S.S.40 TRACK	(TEAC)	£ 228.85
MMB57	DISK DRIVE D.S.80 TRACK	(TEAC)	£ 396.75
MMB58	DISK DRIVE 2°D.S.80 TRACK	(TEAC)	£ 711.85
MMB59	2 DRIVE CABLE FOR ABOVE		£ 17.25
MMB60	APL FOR BBC COMP (BOOK)		£ 8.95
MMB61	30 PROGS FOR BBC (BOOK)		£ 4.95
MMB62	PROG THE 6502 (BOOK)	(R. ZAKS)	£ 10.75
MMB63	6502 APPLICATIONS (BOOK)	(R. ZAKS)	£ 10.75
MMB64	BBC MICRO REVEALED (BOOK)	(J. RUSTON)	£ 7.95
MMB65	LET BBC TEACH (BOOK)	(T. HARTNELL)	£ 6.45
MMB66	30 HOUR BASIC (BOOK)	(C.PRIGMORE)	£ 5.95
MMB67	Z80 PROC WITH DISK DRIVE	(TORCH)	£1144.25
MMB68	6502 SOFTWARE DESIGN	(L.J.SCANLON)	£ 10.25
MMB69	INTRODUCTION TO FORTH	(K. NECHT)	£ 8.25
MMB70	DISCOVER FORTH	(T. HOGAN)	£ 10.25
MMB71	PRACTICAL PROGS FOR 6502	(W.J.WELLER)	£ 14.95
MMB72	PRACT PROGS FOR BBC & ATOM	(D. JOHNSTON-DAVIS)	£ 5.95
MMB73	THE COMPUTER BOOK	(BBC)	£ 6.75
MMB74	EASY PROG FOR BBC	(E. DEESON)	£ 5.95
MMB75	GAMES FOR BBC COMPS PLAY	(T.HARTNELL)	£ 5.95
MMB76	BASIC P'GRAMMING FOR BBC	(N. & P. CRYER)	£ 5.95
MMB77	FORTH PROGRAMMING	(SAMS)	£ 12.50
MMB78	1.2 OPERATING ROM	(ACORN)	£ 11.50







MICRO MANAGEMENT ORDER FORM

CODE	ITEM	QTY	AT £	AT p	COST £	COST p
CREDIT CARD No			SUB TOTAL			
NAME	BARCLAY/ACCESS		POST & PACKING			
ADDRESS			**TOTAL**			

BBC MICROS ACCESSORIES

Overseas dealers and distributors enquiries welcomed. Exports a speciality (p&p–Europe 50% extra, Rest of World 75% extra)



Code	Title	Publisher	Price
MMS021	MASTERMIND	(PROGRAM POWER)	£4.54
MMS022	SPACE MAZE	(PROGRAM POWER)	£6.84
MMS023	COWBOY SHOOTOUT	(PROGRAM POWER)	£6.84
MMS024	ALIEN DESTROYER	(PROGRAM POWER)	£7.99
MMS025	MARTIANS	(PROGRAM POWER)	£6.84
MMS026	SWOOP	(PROGRAM POWER)	£7.99
MMS027	SEEK	(PROGRAM POWER)	£6.84
MMS028	GALACTIC COMMANDER	(PROGRAM POWER)	£7.99
MMS029	CAT & MOUSE	(PROGRAM POWER)	£5.69
MMS030	ZOMBIES	(PROGRAM POWER)	£4.54
MMS031	STARTREK	(PROGRAM POWER)	£5.69
MMS032	REVERSI 1	(PROGRAM POWER)	£5.69
MMS033	CHESS	(PROGRAM POWER)	£7.99
MMS034	WORLD GEOGRAPHY	(PROGRAM POWER)	£6.84
MMS035	JUNIOR MATHS	(PROGRAM POWER)	£6.84
MMS036	DISASSEMBLER	(PROGRAM POWER)	£6.84
MMS037	TIMETREK	(PROGRAM POWER)	£7.99
MMS038	ADVENTURE	(PROGRAM POWER)	£7.99
MMS039	ELDORADO GOLD	(PROGRAM POWER)	£6.84
MMS040	LASER COMMAND	(PROGRAM POWER)	£7.99
MMS041	ASTRO NAVIGATOR	(PROGRAM POWER)	£5.69
MMS042	MICRO BUDGET	(PROGRAM POWER)	£ 7.99
MMS043	FILER	(PROGRAM POWER)	£10.29
MMS044	CONSTELLATION	(PROGRAM POWER)	£ 6.84
MMS045	BEEBTAPE	(CSL MICRODATA)	£ 4.60
MMS046	MICRODERBY	(BUG-BYTE)	£ 5.50
MMS047	SPACE PIRATES	(BUG-BYTE)	£ 8.00
MMS048	CHESS	(BUG-BYTE)	£ 8.00
MMS049	HUMIDITY & TEMPERATURE	(CHRIS HALL ENG)	£24.00
MMS050	CLOCK/CALENDAR	(CHRIS HALL ENG)	£35.50
MMS051	ILLUMINATION	(CHRIS HALL ENG)	£18.00
MMS052	TEMPERATURE	(CHRIS HALL ENG)	£35.50
MMS053	ARCADIANS	(ACORNSOFT)	£ 9.95
MMS054	SNAPPER	(ACORNSOFT)	£ 9.95
MMS055	METEORS	(ACORNSOFT)	£ 9.95
MMS056	CREATIVE GRAPHICS	(ACORNSOFT)	£ 9.95
MMS057	TREE OF KNOWLEDGE	(ACORNSOFT)	£ 9.95
MMS058	BUSINESS GAMES	(ACORNSOFT)	£ 9.95
MMS059	PEEKO-COMPUTER	(ACORNSOFT)	
MMS060	ALGEBRAIC MANIPULATION	(ACORNSOFT)	£ 9.95
MMS061	MONSTERS	(ACORNSOFT)	£ 9.95
MMS062	PLANETOID	(ACORNSOFT)	£ 9.95
MMS063	ARCADE ACTION	(ACORNSOFT)	£11.90
MMS064	DESK DIARY	(ACORNSOFT)	£ 9.95
MMS065	PHILOSOPHERS QUEST	(ACORNSOFT)	£ 9.95
MMS066	LISP	(ACORNSOFT)	£16.85
MMS067	GRAPHS & CHARTS	(ACORNSOFT)	£ 9.95
MMS068	CREATIVE GRAPHICS (BOOK)	(ACORNSOFT)	£ 7.50
MMS069	LOGO II	(COMPUTER CONCEPTS)	£11.50
MMS070	FRUIT MACHINE	(BUG-BYTE)	£ 5.50
MMS071	FORTH	(LEVEL 9)	£17.25
MMS073	HITCH-HIKER	(COMPUTER CONCEPTS)	£ 6.67
MMS074	SPACEHAWKS	(COMPUTER CONCEPTS)	£ 8.97
MMS075	ASTEROID BELT	(COMPUTER CONCEPTS)	£ 8.97
MMS076	CHESS	(COMPUTER CONCEPTS)	£11.50
MMS077	ANGLEZUP	(GEM SOFTWARE)	£ 6.88
MMS078	L TRAP	(GEM SOFTWARE)	£ 6.88
MMS079	TAKE OFF	(GEM SOFTWARE)	£ 5.73
MMS080	GRAPH CAPERS	(GEM SOFTWARE)	£ 6.88
MMS081	MONTE CARLO	(GEM SOFTWARE)	£ 6.88
MMS082	SPACE WARP	(GEM SOFTWARE)	£ 9.00
MMS083	GOLF	(BUG-BYTE)	£ 5.50
MMS084	DRAGON QUEST	(BUG-BYTE)	£11.50
MMS085	AIRLIFT	(BUG-BYTE)	£ 5.50
MMS086	POLARIS	(BUG-BYTE)	£ 5.50
MMS089	CUBE MASTER	(BUG-BYTE)	£ 9.95
MMS090	GRAPHS & CHARTS (BOOK)	(ACORNSOFT)	£ 7.50
MMS091	HOME FINANCE	(ACORNSOFT)	£10.00
MMS092	EARLY LEARNING	(BBC)	£10.00
MMS093	MUSIC	(BBC)	£10.00
MMS094	THE COMPUTER PROG VOL 1	(BBC)	£10.00
MMS095	THE COMPUTER PROG VOL 2	(BBC)	£10.00
MMS096	PAINTING	(BBC)	£10.00
MMS097	DRAWING	(BBC)	£10.00
MMS098	GAMES OF STRATEGY	(BBC)	£10.00
MMS099	FUN GAMES	(BBC)	£10.00
MMS100	THE COMPUTER BOOK	(BBC)	£ 6.75
MMS101	SALES LEDGER DISK	(MICRO MAN)	£57.44
MMS102	PURCHASE LEDGER DISK	(MICRO MAN)	£57.44
MMS103	FILE IT DISK	(MICRO MAN)	£22.94
MMS104	MAILING LIST DISK	(MICRO MAN)	£11.44
MMD105	WORD SEQUENCING	(ACORNSOFT)	£15.35
MMD106	MISSING SIGNS	(ACORNSOFT)	£15.35
MMD107	SENTENCE SEQUENCING	(ACORNSOFT)	£15.35
MMD108	ROCKET RAID	(ACORNSOFT)	£11.50
MMD109	MONSTERS	(ACORNSOFT)	£11.50
MMD110	SNAPPER	(ACORNSOFT)	£11.50
MMD111	METEORS	(ACORNSOFT)	£11.50
MMD112	PLANETOID	(ACORNSOFT)	£11.50
MMS113	INVADERS	(I.J.K.)	£ 7.50
MMS114	MUTANT BREAKOUT	(I.J.K.)	£ 6.50
MMS115	3-D MAZE	(I.J.K.)	£ 4.50
MMS116	BEEB BEEP	(I.J.K.)	£ 4.50
MMS117	HYPERDRIVE	(I.J.K.)	£ 6.50
MMS118	SUPER HANGMAN	(I.J.K.)	£ 4.50
MMS119	FLAGS	(I.J.K.)	£ 4.50
MMS120	STRATOBOMBER	(I.J.K.)	£ 7.50
MMS121	FAMILY GAMES	(I.J.K.)	£ 4.50
MMS122	ATLANTIS	(I.J.K.)	£ 7.50
MMS123	BEEBMUNCH	(I.J.K.)	£ 6.50
MMS124	STARTREK/CANDYFLOSS	(I.J.K.)	£ 6.50
MMS125	WORDPRO	(SOFTWARE FOR ALL)	£10.50
MMS126	POLAR BEAR	(SOFTWARE FOR ALL)	£ 7.45
MMS127	DATABASE FOR 16/32K	(SOFTWARE FOR ALL)	£ 9.95
MMS128	J.R.	(SOFTWARE FOR ALL)	£ 6.95
MMS129	SPACE KINGDOM	(SOFTWARE FOR ALL)	£ 7.95
MMS130	CAR WARS/ALIEN PLANET	(SOFTWARE FOR ALL)	£ 6.95
MMS131	TIME TRAVELLER	(SOFTWARE FOR ALL)	£ 6.95
MMS132	UTILITY PACK 1	(SOFTWARE FOR ALL)	£ 7.45
MMS133	ZOMBIE ISLAND	(SOFTWARE FOR ALL)	£ 7.94
MMS134	ROW OF FOUR	(SOFTWARE FOR ALL)	£ 6.54
MMS135	BEEBTREK	(SOFTWARE FOR ALL)	£ 7.95
MMS136	GALACTIC INTRUDER	(SOFTWARE FOR ALL)	£ 6.95
MMS137	INHERITANCE	(SIMON W. HESSEL)	£ 5.95
MMS138	GREAT BRITAIN LTD.	(SIMON W. HESSEL)	£ 5.95
MMS139	WORLD TRAVEL GAME	(SIMON W. HESSEL)	£ 6.95
MMS140	PASCAL	(CHALKSOFT)	£ 5.95
MMS141	ANGLE	(CHALKSOFT)	£ 8.95
MMS142	INKOSI	(CHALKSOFT)	£ 5.95
MMS143	INVISIBLE MAN	(CHALKSOFT)	£ 5.95
MMS144	LETTERS	(CHALKSOFT)	£ 9.95
MMS145	METRICS	(CHALKSOFT)	
MMS146	SEQUENCES	(CHALKSOFT)	£ 5.95
MMS147	CASTLE OF RIDDLES	(ACORNSOFT)	£ 9.95
MMS148	BBC BASIC COMPILER	(J. RUSTON)	£39.68



Local Authorities and Government Departments. Orders welcomed. Educational Seminars given.

ECONET? ASK US

Mail or telephone order
Barclaycard or Access Credit Card accepted

Access | BARCLAYCARD VISA

Only defective or faulty goods may be returned.

MICRO MANAGEMENT

SPECIAL OFFER
Post and Packing £1 on all items
Extended to orders also placed in April '83

Micro Management 32 Princes Street, Ipswich, Suffolk. Telephone: (0473) 59181

£98 TEXET TX-8000

TEN YEARS AFTER Texet drove Sinclair out of the pocket calculator market the TX-8000 is ready to take on the ZX-81 and the Spectrum. As with the calculators Texet hopes to win customers by aggressive pricing. But although the £98 TX-8000 is now the cheapest colour micro — by a whisker from the Oric and by £27 from the Spectrum — it has only 4K RAM as opposed to the 16K of its rivals.

The Z-80 based TX-8000 has a specification that, on paper, looks very good compared with the ZX-81. When it is compared with, for example, that of the Oric, then a number of weaknesses become apparent.

Of the three colour computers under £125 — the Spectrum, Oric and TX-8000 — the TX-8000 is the largest. It case is made of a cream plastic, which feels more brittle than the plastic used for its rivals — but it would still require an act of malice to break it. The design of the case is not as polished as that of its rivals, but it does have a gently sloping front which means the keys actually face the user.

The dimensions of the case are 12in. wide by 6in. deep, 2in. high at the rear and 1in. high at the front. The panel containing the keys is dark brown and sunken into the body. There are 45 keys in a rubber keyboard which is very similar to that of the Spectrum. Not only do the keys squash down in the same way they even have that distinctive clammy feel to them. If anything the Texet keyboard feels worse than the Spectrum's.

Individual keys are smaller than on the Spectrum, but there are more of them. Keyboard layout is based on the usual QWERTY typewriter formation, which the TX-8000 mimics better than the Spectrum. This necessitates fewer key depressions, especially in the case of punctuation symbols which can only be achieved by a shifted key on the Spectrum but have their usual typewriter keys on the TX-8000.

Above the first eight number keys there are the corresponding colour names; yellow, blue, red, buff, cyan, magenta, orange and green. This is the same colour set as on the Spectrum but with the addition of buff and orange. Interestingly, there is no black or white, which look in theory to be unobtainable.

When using the keyboard the letter pressed is what appears on the screen, even though certain Basic keywords are printed above and below the keys. The keywords are accessed by the kind of finger gymnastics that put me off the Spectrum when it first appeared. Alongside the keyboard is a power light which tells you when the machine is on, which sometimes is not apparent from looking at the screen.

On the right-hand side of the machine is a rocker-type switch, to turn the power on and off. This is a welcome feature, as anyone using a Spectrum or ZX-81 will know that the continual insertion and removal of the power supply plug eventually works it loose. So a cold reset — that is a reset of the computer which clears the RAM — is a simple operation.

Although the machine is marketed in this country as the Texet TX-8000, elsewhere it is known as the Video Technology VZ-200. This is taking badge engineering to new heights. The Texet is exactly the same as the Video Technology machine except for the VZ-200 badge. Both machines are manufactured in Hong Kong, the factory-door price of the VZ-200 being $66 — less than £45.

The real significance of this similarity is that there are a number of interesting peripherals available for the VZ-200, which will work with the Texet. These include: 16K and 64K Ram extensions, joysticks, printer, light-pen, Modem, disc-drives and bar-code readers. There is also an interface unit which allows you to use any standard text or graphics printer. All these add-ons are manufactured by Video Technology in Hong Kong and will be available in the U.K. from Texet. Projected prices are: printer, £129; 64K Ram expansion, £52; £8 for a single paddle and £60 for a pair of cordless remote control joysticks.

Opening up the inside of the Texet is like digging in the garden of the Cricklewood house of horrors. A number of vaguely familiar objects are recognisable amongst the mess even though all the identifying codes on the chips have been painted out to preserve their anonymity. There is a black and white model of the VZ-200 in Hong Kong and one look inside the case of the Texet shows that it is basically a black and white computer that has been converted for colour. The colour circuitry is antique by the standards of the Oric or the Spectrum, with a large number of presets, pots, coils and resistors.

On the rear of the machine are the usual power and TV output sockets. In addition there is a tape socket, which unlike conventional tape sockets is a stereo jack socket — the kind used on portable hi-fis. This connects to two mono jack plugs, red and black, the red one being the Ear connection and black the Mic.

There is also a monitor output — which will not work with most monitors. Also along the back of the machine, but covered by a couple of aluminium panels are the bus expanders. One is marked Memory Expansion and the other, Peripheral. This may imply that only one peripheral can be connected at a time. The panels are attached to the computer by two tiny screws.

Power for the micro comes from a transformer which would plug straight into the power socket except that it has a two-pin electric shaver-type plug. This needs a special adapter to enable it to be used with domestic U.K. power sockets. Unfortunately the pennies this adds to the price of the micro makes the Texet only a pound cheaper than the Oric.

Because the transformer itself is attached to the plug its weight causes it to work its way out of the socket. While this is not likely to be dangerous, due to the insulation on the pins, it does mean that a programming session can be ruined and all work lost due the the resulting power failure.

When the machine is powered up the message:

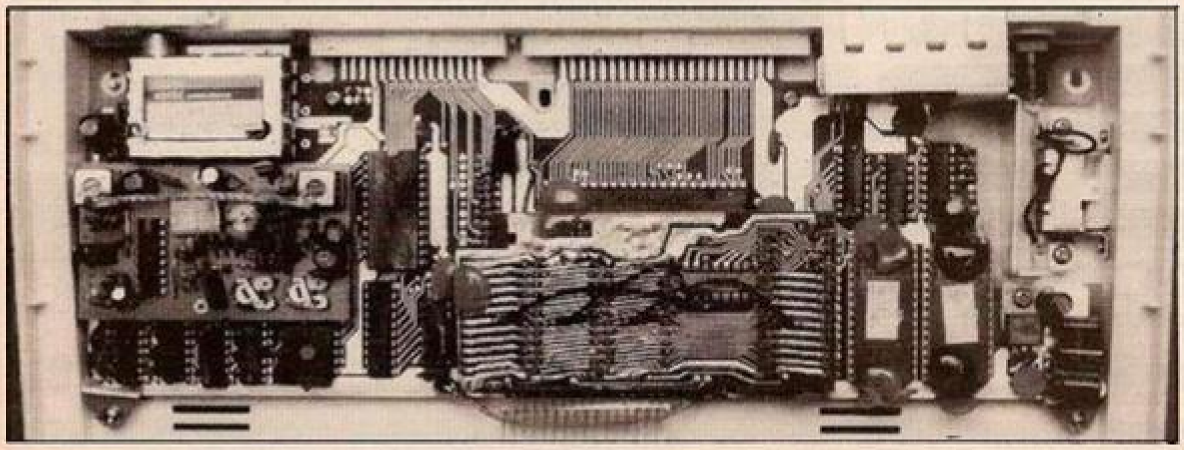
VIDEO TECHNOLOGY
BASIC V1.0

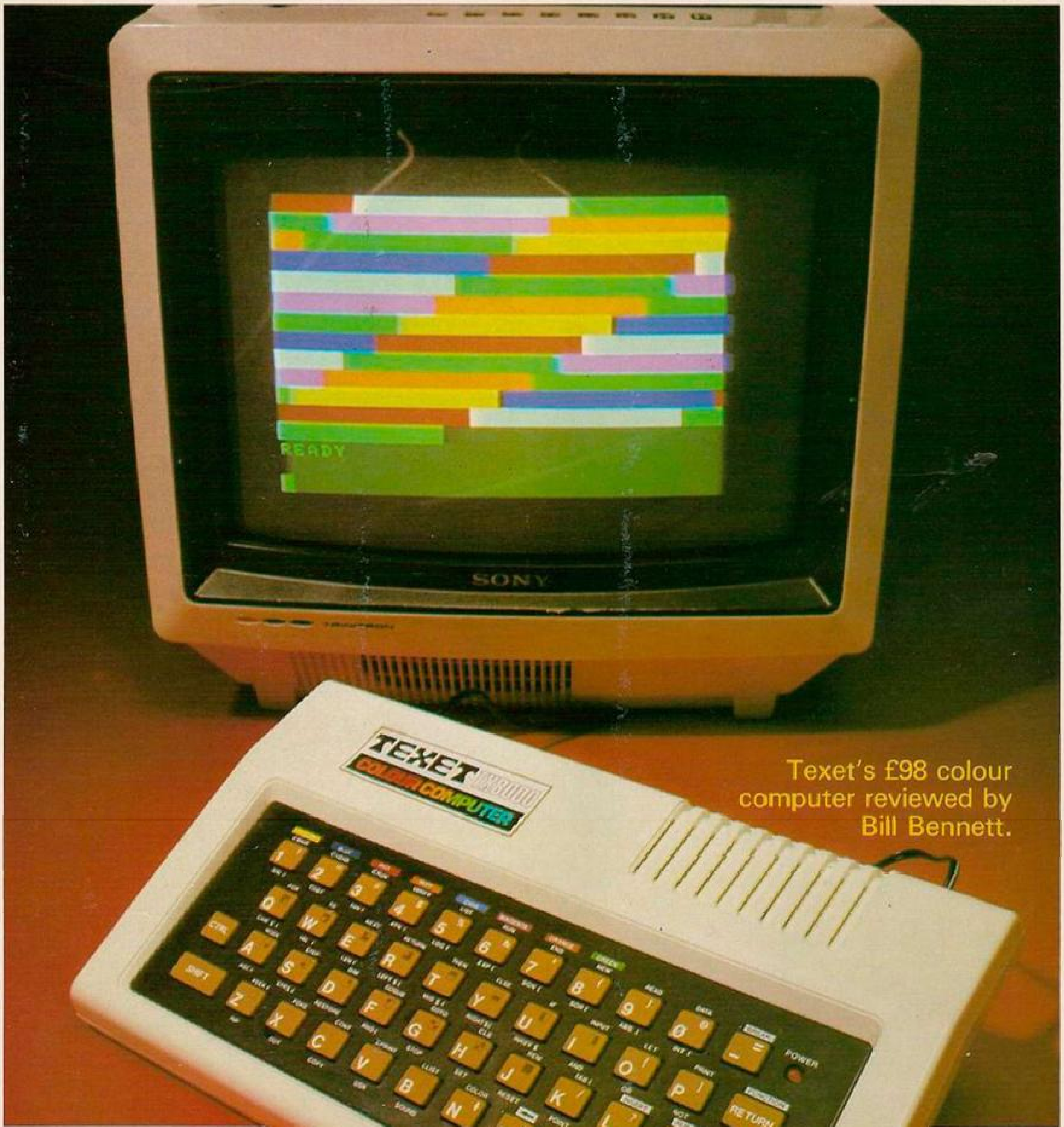
appears. The letters are in light green on a darker green background with the whole surrounded by a black border. The cursor — a square of light green, flashes on and off. If the on/off switch is flicked momentarily to the off position and back again a bizarre effect on screen is caused by the memory-mapped screen area of RAM being filled with garbage.

The TX-8000 has only 4K RAM — and 2K is available for programs, the other 2K is for the screen. The maximum size of a numeric array defined in a Basic DIM statement is 1313 locations and a string array can hold 1751 strings.

Of course should you decide to use arrays that big, there will not be any room left for the program. Anyone who has used the ZX-81 might think 2K is a lot of memory, especially when it does not have to store the display as well. If you were a bit tight for space, you could try storing numbers as strings though.

With internal circuitry that looks like this (below) it is not surprising that colours are displaced by half a character on screen.





Texet's £98 colour computer reviewed by Bill Bennett.

Arrays may be multidimensional, but be warned, arrays of more than one dimension eat heavily into the memory. By the time you get to an array of seven dimensions, (2,2,2,2,2,2,2), you have run out of memory.

A simple line of Basic, such as:

```
10 x=20
```

only takes up four bytes so a reasonable program can be squeezed into the memory. However this compares very unfavourably with the Oric, which is only a fraction more expensive, but has a nominal 16K of RAM.

The organisation of the video memory is interesting, in the normal text mode — which is called from Basic by the command Mode(0), the first 512 bytes of video memory store the ASCII codes of the screen characters.

Any of the machine's character set of 255 characters can be Poked into this memory, and of course it is the area that the Print command uses.

All the usual characters appear in the set, together with their inverses. In addition there is a subset of graphic characters which consist of the character square divided into four smaller squares, filled in all possible combinations. This graphic subset is repeated four times. When the machine is initially turned on this character set appears in four different colours but use of the Color command — which is similar to Ink on the Spectrum — changes this, and the four sets seem to change to arbitary colours.

(continued on page 59)

WHO ON EARTH COULD HAVE CONCEIVED QUICKSILVA SOFTWARE?

TIME-GATE
by J. Hollis

THE UNBELIEVABLE SPACE/TIME ADVENTURE FROM QS!

High speed graphics combined with electrifying space adventure make TIME-GATE the game of all games.
Foil the ruling aliens by travelling back through time and blasting out their home planet. Fight 3D space battles on your journey, seeking the time gates that lead to year zero and the salvation of the human race.
Features: 4D — High speed graphics — versatile scanning — status and battle computers — land & take-off from many planets — time-travel — 5 skill levels — score & rating plus free training program.
SPECTRUM 48K

NEW! TORNADO . . .
by Chartec

ONLY AVAILABLE FROM QS!

Your ship is a Tornado. A craft specially designed for use over the Red Planet able to manoeuvre fast and effectively in the thin atmosphere. Now the end of Colony Wars is in sight, a final pocket of seething hate has been located and is about to be eradicated, the last clan will shortly fall . . . If the mission is successful . . .
Features: Full Colour High Res Graphics — Sound — Scoring — Ships Attacking — 3 Types of Ground Base — 2 Player Option — Increasing Speed — High Score — Progressive Difficulty — Random Landscapes — Explosions.
VIC 20 [redacted] JOYSTICK

NEW! GALAXIAN & GLOOPS
by T. Beckwith

GALAXIAN
The battle rages on the distant planet. Only you can save the peaceful population under attack. Are you good enough?
Features: Full Attack Mode — High Score — 2 Types of Swooping Bomb Dropping Galaxian — 3 Bases — Full Scoring — Adjust Speed, Fire Rate, Number of Galaxians.

GLOOPS!
Quicksilva offer this special version of the famous pill-eater on this tape just for the hell of it!
ZX81 16K

NEW! MAGIC WINDOW
by M. Walker

Character Generator supplied on tape.
Features: Define characters on 8x8 grid — Save to Tape — Load from Tape — Hex & Dec O/Ps.
Character Manipulation: Mirror — Rotate — Invert — Left — Right — Up — Down — Hold — Wipe — Cancel.
Redefine Whole Character Set.
Also works in Colour Mode.
Excellent examples supplied.
ATARI 400/800 + JOYSTICK

NEW! MUNCHEES
by A. Laird

Outwit the Ghost in the creaking house. Keep taking the pills — Power Pills to keep you one step ahead of a sticky end!
Features: 1-4 Ghosts — 3 Munchees — Power Pills — Side Doors — Fruit — High Score — Bonus Munchy — Increasing Speed.
ZX81 16K

NEW! MINED-OUT
by I. Andrews

Enter the minefield at your peril. However, you must [illegible] all the Worm at all costs. If you are very skilled you will be able to rescue the Damsels in Distress, also trapped in the minefield.
Features: 9 Levels of Play — High Score — Progressive Difficulty — Tricky Mines — Damsels in Distress — Mine Detector — Safe Areas.
SPECTRUM 48K

NEW! CROAKA CRAWLA
by J. Field

Save Clint Frog from a messy fate. Watch out for the relentlessly approaching trucks that are tired of hedgehogs. Look out for the Crocodiles, they are equally Frog-Hungry!
Features: Frogs — Lorries — Logs — Turtles — Different Levels of Play — Scoring — Frog Count — Flies — Crocodiles — Sinking Turtles — Progressive Difficulty — Attack Waves.
ZX81 16K

CHESS PLAYER
by M. Wren-Hilton

Speech & Personality
SPECTRUM 48K

SPEAKEASY
by J. Hollis

Add sound or speech to your program
SPECTRUM 48K

METEOR STORM
Speech and Arcade Action
SPECTRUM 16K

SPACE INTRUDERS
Mutants and Arcade Action
SPECTRUM 16K

For the ZX81 & 16K Ram:
QS SCRAMBLE QS INVADERS
QS ASTEROIDS QS DEFENDA

Fantastic New Pixel Games from Quicksilva
See announcement for details!

TORNADO	NEW!	VIC 20	+ J/S	£5.95	☐
MAGIC WINDOW	NEW!	ATARI	400/800 + J/S	£8.95	☐
TIME-GATE		SPECTRUM	48K	£6.95*	☐
MINED-OUT	NEW!	SPECTRUM	48K	£4.95*	☐
CHESS PLAYER		SPECTRUM	48K	£6.95	☐
SPEAKEASY		SPECTRUM	48K	£4.95	☐
METEOR STORM		SPECTRUM	16K	£4.95*	☐
SPACE INVADERS		SPECTRUM	16K	£4.95*	☐
GALAXIAN & GLOOPS	NEW!	ZX81	16K	£4.95	☐
CROAKA CRAWLA	NEW!	ZX81	16K	£3.95	☐
MUNCHEES	NEW!	ZX81	16K	£3.95	☐
QS SCRAMBLE		ZX81	16K	£3.95	☐
QS INVADERS		ZX81	16K	£3.95	☐
QS ASTEROIDS		ZX81	16K	£3.95	☐
QS DEFENDA		ZX81	16K	£3.95	☐

* FREE KEYBOARD OVERLAY WITH THESE GAMES *

PLEASE SEND ME THE GAMES AS TICKED

NAME ....

ADDRESS ....

....

....

Access VISA

SEND ORDER TO:
QUICKSILVA, DEPT YC, 92 NORTHAM ROAD, SOUTHAMPTON SO2 0PB TEL: (0703) 20169

AVAILABLE FROM BOOTS, W.H. SMITHS, MENZIES AND ALL LEADING COMPUTER STORES.

(continued from page 57)

Color only affects the graphic symbols. There is no provision for printing words or letters in colour. What is strange is a lack of black or white on the screen. In practice the colour designated as Buff is slightly off-white and for most purposes can be used in its place. Black can be obtained only as the other colour in the graphic symbol character set.

There is a major problem with the colour on the Texet, it seems that each of the colours is attributed to a character space that is displaced half a character to the right of the printed character. That is, the printed characters and their assigned colours do not match up on the screen. This could be a fault in the review machine, but looking at the colour circuitry within it is not surprising.

It is a shame about the colour location problem, because the colours themselves are the brightest on any of the cheaper colour computers. The red is a little darker than it should be, but the blue and orange are as luminous as Day-Glo colours. The colours can be changed by altering the controls of your TV set, but the alignment problem cannot be ironed out.

The graphics characters can be printed or Poked on to the screen by using their character codes, but they are also accessible from the keyboard. To print them in, say, a pair of quotes inside a Print statement, you have to press both shift and control at once, then the relevant graphics key. Graphics are printed on the key switches, so you have some idea which one you are using. On the Z key a graphic block is printed which does not correspond to the character printed by that key, and keys: x, c, v, b, are merely repeats of characters that can be found elsewhere and consequently are not marked.

When printed directly from the keyboard the graphics characters appear in the default light and dark green colour set. After a Color command however they will be printed on the screen in that colour. The characters print on to the screen extremely fast in this mode, a thousand colour graphic strings taking less than 20 seconds. But there is a price to pay. A string can only contain graphic characters of one colour, and that colour is always the colour specified by the preceding Color command.

In the text graphics mode, mode 0, the screen is organised into 16 lines of 32 characters. This compares with 24 lines of 32 on the Spectrum — or more correctly 22 usable lines, and 28 by 40 on the Oric — which is a Prestel-like display.

High-Resolution mode, mode 1, is not really high-resolution at all. There are only 128 by 64 pixel locations, which is not much better than some — albeit much more expensive — microcomputers' text mode. This takes up the entire 2K of the video memory, which is interesting because 128 × 64 is not 2K, but 8K.

It works in a way that is similar to the text mode. There are 32 columns and 64 rows, each of which can have any value up to the eight-bit limit of 255. In text mode these normally represent characters, but in mode 1 they represent short graphic strings of four pixels, arranged in a line one after the other. Poking a value into one of these locations specifies the colour of each of those four pixels.

Obviously not all possible combinations of the eight colours in four pixels can be accommodated — there are 4,000. Unfortunately thanks to the colour misalignment, colour is not always visible in this mode.

Light green is the only possible background allowed in the so-called high-resolution mode. To let you know that the mode has changed from low-resolution/text to the pseudo high-resolution the border colour changes from soot black to the same lime green as the rest of the screen. This is to avoid any confusion between what might be called low-resolution 1 and low-resolution 2.

So bad is the colour misalignment that when a sine curve is displayed on the screen, it appears as black on the lime green background, with a hint of whatever the chosen colour was around the edges. This makes a mockery of the TX-8000's ability to display any of its eight colours at any one of the 128 by 64 locations.

Poking to the display is a complicated business in this mode, so there are adequate Basic commands to handle the graphics. They are Set and Reset — which plot and unplot points on the screen, and Point which examines a position and tells you if it is on or off.

Despite the ventilation both in the top of and under the case, the machine can become very hot. This could be due to the poor thermal contact of the heat sink, which was only loosely connected to the power supply semiconductor. This can cause problems. When the machine was turned off momentarily — due to the transformer falling out of the socket — the television had to be retuned to obtain a picture.

TX-8000 Basic is a fairly standard version of Microsoft Basic. It holds few surprises but does have some refinements that, if omitted, would make the Texet a very old-fashioned machine indeed. There is the Step to go with For . . Next, and the Else to supplement the If . . Then. As far as structures go, the TX-8000 is a non-starter.

Cassettes are loaded with the CLoad command, which causes the machine to print Bad on the screen whenever a load fails. Loading is extremely difficult because unlike the Spectrum there is no screen display to let you know how well the load is going.

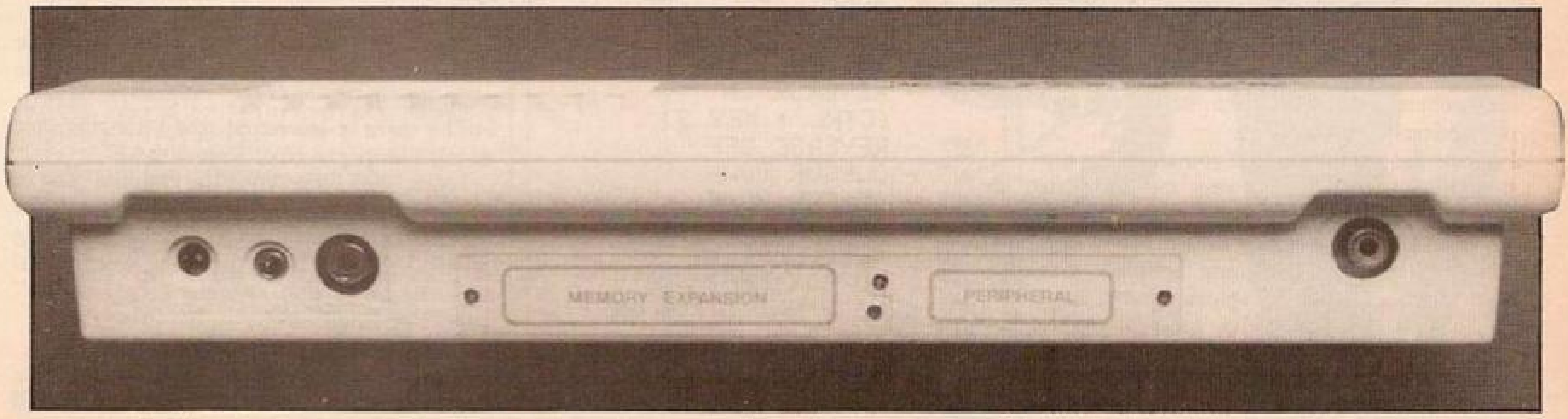
CSave is accompanied by a Verify command, which no self-respecting micro would be seen without these days. All the tape operations are performed at 600 baud which is faster than the ZX-81 but slower than the Spectrum — the Oric allows you to choose speeds. The speed could be at the root of the loading problems but more likely the main offender is the power socket, which is located right next to the cassette socket.

Basic programming lines cannot be longer than two screen lines. If you try entering one longer you simply lose it without warning. The Sound command is feeble compared to the Oric. All it can do is play rather quiet tones — there is no loudspeaker. The Sound command has two parameters, the first being the pitch. This can have any integer value between 1 and 31. If a decimal number is input it simply truncates and plays the next one down. The second parameter is the length of the tone and this is variable between one and nine.

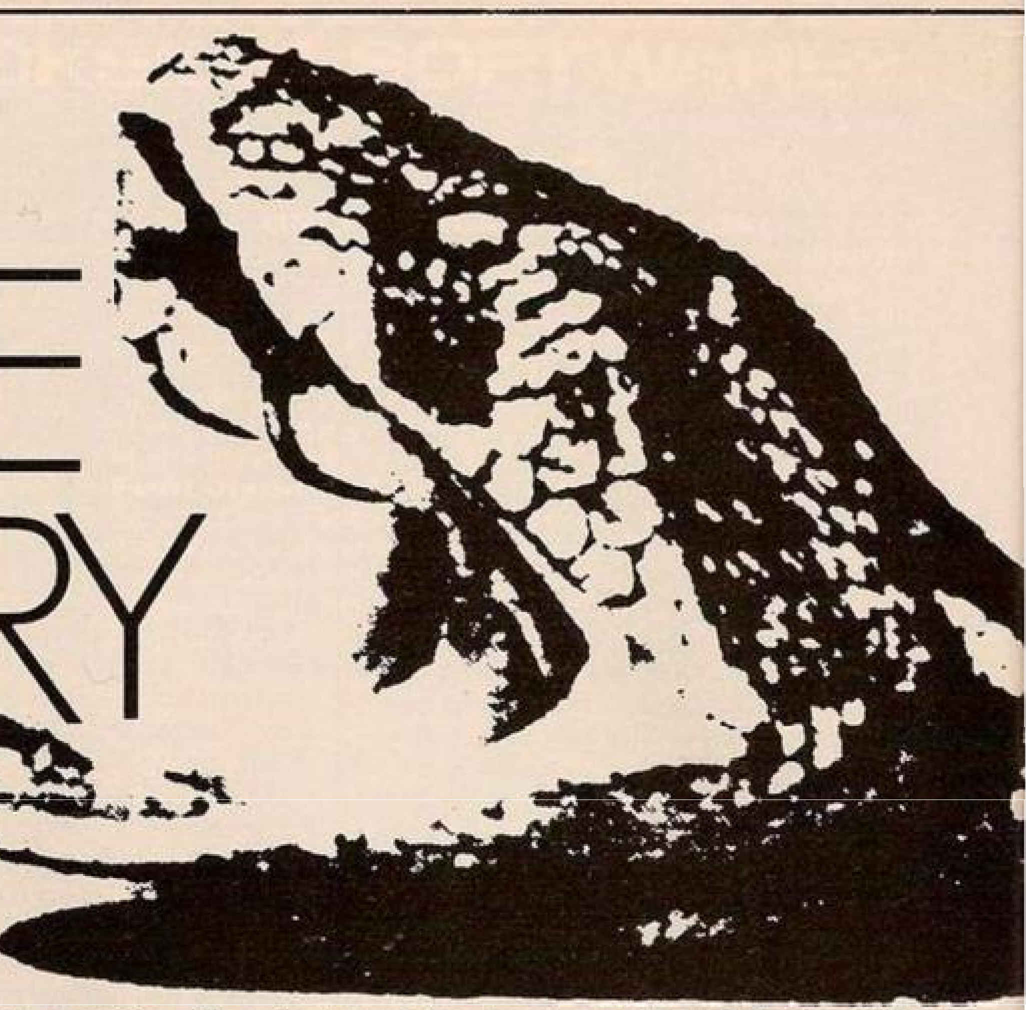
Numbers can only be printed to six significant figures which means that should a business be in such bad shape that it decides to install a TX-8000 as a computer, it will never be able process debts greater than £9,999.99. To ensure neatness trailing zeros are suppressed. ■

CONCLUSIONS

- The Texet TX-8000 may enjoy a brief period of fame as the cheapest colour computer around but too many compromises have been made.
- The colour display on the screen needs tidying up as does the internal construction of the Texet. If this was done then the peripherals available for the TX-8000 — especially 64K expansion for £52 might make it worth a second glance.
- The shortcomings of the £98 Texet make the high standards of the £99 Oric and the £125 Spectrum seem all the more remarkable.



FANGS FOR THE MEMORY — 3·5K



HERE IS AN implementation of Snake for the Vic-20. Although in Basic, it is fast and addictive, and makes good use of defined and multicoloured graphics. The game, admittedly inspired by the veritable plague of ZX Snakes in February's Software File, just squeezes into the basic machine. Little space is left for instructions so do not enter line 10.

Using the S, X, < and > keys you steer the head of a snake. When you first Run the program, you get five seconds grace before the snake automatically moves down the screen.

The object is to clear the screen of flies and beetles. Watch out for the mushrooms though — they are poisonous. Both beetles and flies make the snake grow, but flies more so than beetles. The flies also score more. The more you eat, the faster the snake moves.

If you run into yourself, being a poisonous snake, you will die. One other snag — if you run into the surrounding fence, or try to move alongside yourself, you will find the snake stops, and your score decreases rapidly. And if your score ever gets below zero, the Vic assumes you have committed suicide. This is why you can only move left or down at the start. You could also find yourself boxed in.

Swarm of insects

If you manage to clear the screen, another swarm of insects descends, although the snake stays the same length, and a batch of 10 extra mushrooms grow. The game therefore grows progressively harder.

When the game is over, if you are in the top five scores, you can enter your initials in the Hall of Fame.

This program is a perfect illustration of how straightforward programming coupled with the Vic's excellent graphics and sound capabilities can produce a good enjoyable game.

Here is a breakdown of the program: lines 20-100 initialise it and line 50 lowers RAMtop to protect defined graphics. The fixed graphics characters start at line 60.

S = Segment of snake
M = Mushroom
B = Beetle
F = Fly
W = Wall

At line 100, NM sets the initial number of mushrooms, and Poke V,47 sets the auxiliary colour for the defined graphics used in the program.

Lines 120-140 set up the starting position of the snake's head — HP — and tail — TP — and display it as well as setting its starting direction D and its head character H. Lines 170-190 wait five seconds for a key to be pressed and then continue. Lines 210-250 work out the snake's new direction, depending on which key was pressed, and from that work out the character to be used for the snake's head.

```
THESE ARE SOME OF THE
COLOUR AND CURSOR CONTROL
CHARACTERS USED IN THE
PROGRAM

FOR "£" READ INVERSE POUND
(CTRL + KEY 5)
"■" - BLACK (CTRL + KEY 1)
"■" - WHITE (CTRL + KEY 2)
"■" - CYAN (CTRL + KEY 4)
"■" - GREEN (CTRL + KEY 6)
"■" - YELLOW (CTRL + KEY 8)
"■" - REVERSE ON
      (CTRL + KEY 9)
"■" - REVERSE OFF
"■" - CURSOR DOWN
"■" - CURSOR HOME
"■" - CLR
"■" - CURSOR RIGHT
"■" - CURSOR LEFT
USE KEYS S AND X FOR UP
AND DOWN
USE KEYS < AND > FOR LEFT
AND RIGHT
```

All the checks on where the snake is are contained in lines 280-310. These lines also verify that the move is allowed, and branch to the appropriate part of the program if necessary.

Line 320 checks if all the beetles and flies have been eaten, and if they have, displays some more. This line also adds 10 more mushrooms. This is the end of the main loop.

Move-snake routine

The move-snake routine is at lines 500-570. It does this by simply moving the snake's head forward and erasing the tail. If the extra-length — EL — variable is greater than zero, it subtracts one from it and skips the erase tail section.

After it has erased the tail, it then looks for a segment next to it, which becomes the new tail. Incidentally, this is the reason why there must always be at least one character between "folds" of the snake as it twists and turns. Otherwise it could confuse this part of the program.

Lines 700-740 and 750-790 are the routines called when either a beetle or a fly is hit. They increase the score and the "extra length" counter.

Lines 800-830 are called when the snake either runs into the wall or tries to move alongside itself.

The score is converted into a six-character string and displayed at lines 900-920.

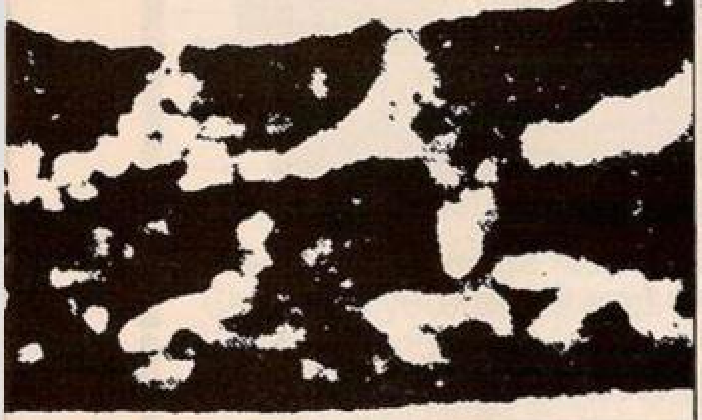
Lines 1000-1200 define the graphics used in the game, and lines 1500-1590 set up the screen display for the game. The lines starting at 1560 display the mushroom, beetles and flies. Lines 2000-2200 are the "game over" part. The length of the

FOR I = 1 TO . . . NEXT

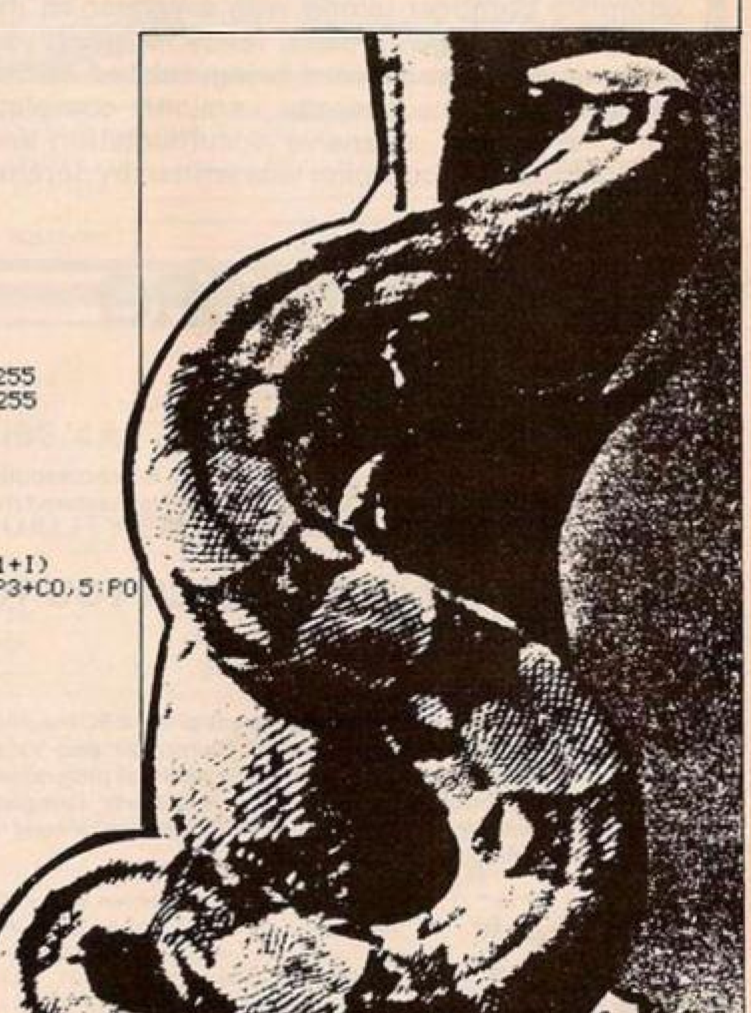
delay in line 2000 produces an interesting strobe effect. ■

VIC-20

A python can swallow a sheep but this economical program by Andrew Dilley will not put any bulges in your Vic-20. If you're partial to flies and beetles, this is the game for you — but take our advice and lay off the mushrooms.



```
10 REM FOR "■" READ INVERSE POUND SIGN (CNTRL+KEY3)
20 DIMB$(5):FORI=1TO5:B$(I)="000000 ???":NEXT
40 DEFFNR(X)=INT(RND(1)*X)
50 POKE56,29:POKE52,29
60 S=42:M=39:B=40:F=41:W=171
70 TC=7680:CO=30720:S1=36874:S2=S1+2:S3=S2+1:V=S2+2:SR=V+1
80 GOSUB3000
100 NM=20:GOSUB1500:POKEV,47
120 HP=TC+10+22*2:L=5:TP=HP+L:D=22:H=46
140 POKEHP,H:POKEHP+CO,1:FORI=HP+1TOTP:POKEI,S:POKEI+CO,13:NEXT
150 SC=0:GOSUB900
160 PRINT"■■■"TAB(16)LEFT$(B$(1),6);
170 T=TI
180 GETA$:IFA$=""ANDTI-T<300THEN180
190 GOTO210
200 IFSC<0THEN2000
205 GETA$
210 Z=22*(A$="S")-22*(A$="X")+(A$=",")-(A$="."):D=-D*(Z=0)+Z
250 H=-43*(D=1)-44*(D=-1)-45*(D=-22)-46*(D=22)
270 POKEHP,H:NP=HP+D:P=PEEK(NP)
280 IFP=MORP=STHEN2000
290 IFP=WORPEEK(NP+1)=SORPEEK(NP-1)=SORPEEK(NP+22)=SORPEEK(NP-22)=STHENGOSUB800
:GOTO200
300 IFP=BTHENGOSUB700
310 IFP=FTHENGOSUB750
320 IFNB=0ANDNF=0THENNM=10:GOSUB1560:GOTO170
330 GOSUB500:GOTO205
500 POKES1,170
510 POKEHP+CO,13:POKEHP,S:HP=NP:POKEHP+CO,1:POKEHP,H
520 IFEL>0THENEL=EL-1:GOTO550
530 POKETP,32
540 TP=TP-(PEEK(TP+1)=S)+(PEEK(TP-1)=S)+22*(PEEK(TP-22)=S)-22*(PEEK(TP+22)=S)
550 POKES1,0
560 FORT=1TO150-4*L:NEXT
570 RETURN
700 POKESR,12:L=L+1:EL=EL+1
710 X=INT((100+5*L)/10)
720 FORI=1TO10:POKES2,200:POKENP,I+128
730 SC=SC+X:GOSUB900:POKES2,0:NEXT:POKESR,10:NB=NB-1:POKENP,32
740 RETURN
750 POKESR,14:L=L+2:EL=EL+2
760 X=INT((150+6*L)/10)
770 FORI=1TO10:POKES2,220:POKENP,I+128
780 SC=SC+X:GOSUB900:POKES2,0:NEXT:POKESR,10:NF=NF-1:POKENP,32
790 RETURN
800 POKES2,180
810 SC=SC-10:GOSUB900
820 POKES2,0
830 RETURN
900 S$=STR$(SC):Q=LEN(S$):S$=LEFT$("00000",7-Q)+RIGHT$(S$,Q-1)
910 PRINT"■▶▶▶▶■"S$
920 RETURN
1000 FORC=35TO46:FORZ=0TO7:READN:POKE7168+8*C+Z,N:NEXT:NEXT
1010 FORZ=8*32TO8*32+7:POKE7168+Z,0:NEXT
1020 RETURN
1100 DATA255,171,171,139,171,171,171,255,255,136,187,139,235,235,136,255
1120 DATA255,136,170,168,170,170,138,255,255,143,191,159,191,191,143,255
1140 DATA56,124,124,254,186,56,56,124,130,84,56,254,56,254,56,254
1160 DATA108,16,124,186,186,186,84,16,40,40,190,190,190,190,40,40
1180 DATA48,104,109,254,254,109,104,48,12,22,182,127,127,182,22,12
1200 DATA36,24,60,126,153,255,126,24,24,126,255,153,126,60,24,36
1500 POKE36869,255
1510 POKESR,10:PRINT"■■■#%&■:"TAB(11)"■#$%&■:"
1520 FORI=0TO21:P1=TC+22+I:P2=TC+22*22+I:P3=TC+22*(1+I):P4=TC+21+22*(1+I)
1530 POKEP1,W:POKEP2,W:POKEP3,W:POKEP4,W:POKEP1+CO,5:POKEP2+CO,5:POKEP3+CO,5:PO
KEP4+CO,5
1550 NEXT
1560 CH=M:C=4:N=NM:GOSUB1700
1570 CH=B:C=5:NB=15:N=NB:GOSUB1700
1580 CH=F:C=7:NF=5:N=NF:GOSUB1700
1590 RETURN
1700 FORI=1TON
1710 P=TC+FNR(20)+1+22*(FNR(19)+3)
1720 IFPEEK(P)<>32THEN1710
1730 POKEP+CO,C:POKEP,CH
1740 NEXT
1750 RETURN
2000 POKES3,200:FORT=1TO250:POKESR,2:FORI=1TO10:NEXT:POKESR,10:NEXT
2050 FORVO=15TO0STEP-.1:POKEV,VO:NEXT
2060 POKES3,0:POKESR,12:POKE36869,240:POKE198,0
2070 PRINT"■■■ KILLED BY A DEADLY":PRINT"■■■ POISONED MUSHROOM "
2080 K=0:FORI=1TO5:IFSC>VAL(LEFT$(B$(I),6))THENK=I:I=5
2090 NEXT:IFK=0THENFORT=1TO1000:NEXT:GOTO2150
2100 PRINT"■■YOU ARE ONE OF THE    TOP FIVE PLAYERS"
2110 PRINT"■ENTER YOUR INITIALS■":INPUTI$:IFLEN(I$)>3THEN2110
2120 FORI=4TOKSTEP-1:B$(I+1)=B$(I):NEXT
2130 B$(K)=S$+" "+I$
2150 POKESR,78:PRINT"■"TAB(5)"■HALL OF FAME"
2160 FORI=1TO5:PRINT"■■"I"■"B$(I):NEXT
2170 PRINT"■■■ANOTHER GO(Y/N)■":INPUTY$
2180 IFY$="Y"THEN100
2190 IFY$="N"THENPRINT"■THANKS FOR PLAYING":END
2200 GOTO2170
3000 POKESR,154:PRINT"■■■ S N A K E -- B Y T E "
3020 PRINT"■ USE THESE KEYS:"
3030 PRINT"■▶▶▶■UP■■|■■■S■▶▶■LEFT-■< >■-RIGHT■▶▶▶▶▶■X■■■|■■■■DOWN"
3040 PRINT"■■■ EAT THE FLIES &":PRINT"■ BEETLES , BUT BEWARE"
3050 PRINT"■■ THE DEADLY MUSHROOMS"
3060 GOSUB1000
3070 PRINT"■■■ HIT ANY KEY TO START";
3080 GETA$:IFA$=""THEN3080
3090 RETURN
```



BBC MICRO INSTANT MACHINE CODE!

Yes, it's true. Instant machine code from a good subset of BBC BASIC. Type your BASIC program into your model B BBC Micro, trigger the compiler, and your program is changed almost instantaneously into superfast machine code.
For £34.95 you get: Cassette version of the complete compiler (along with a version of the compiler for use with discs, ready for when you upgrade, the disc version being dubbed on the cassette after the cassette version); complete compiler listing; extensive documentation and instructions. The compiler was written by Jeremy Ruston.

THE BBC MICRO REVEALED

By Jeremy Ruston

'. . .destined to become the bible of all BBC microcomputer users. . .' (Personal Computing Today). If you've mastered the manual, then this book is for you. Just £7.95

LET YOUR BBC MICRO TEACH YOU TO PROGRAM

By Tim Hartnell

'. . .takes you further into the cloudy areas of the BBC machine than anything else I've yet seen. . .' (Computer and Video Games). If you're just starting out in the world of programming, then this book is the one for you. Forty complete programs, including Othello/Reversi, Piano and a host of dramatic graphic demos. Just £6.45

Interface, Dept.YC
44-46 Earls Court Road, London W8 6EJ
Please send me:

( ) INSTANT BBC MACHINE CODE–tape and book–£34.95

( ) THE BBC MICRO REVEALED–Ruston–£7.95

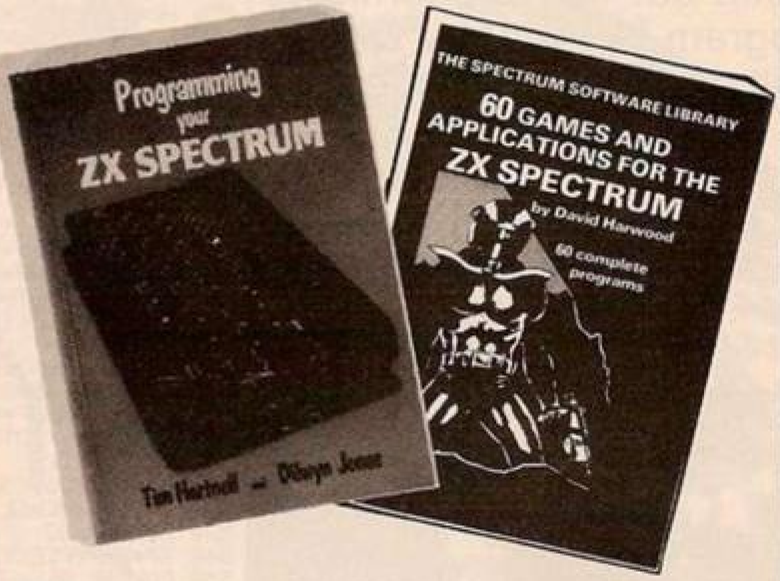
( ) LET YOUR BBC MICRO TEACH YOU TO PROGRAM–Hartnell–£6.45

I enclose £

Name ....

Address ....

SPECTRUM



Make the most of your Spectrum, with these acclaimed books from the experts!

PROGRAMMING YOUR ZX SPECTRUM

Tim Hartnell and Dilwyn Jones

More than 100 routines and programs, 230 pages, and value for every Spectrum user. Learn how to make the most of user-defined graphics (with a Pacman-like program, DOTMAN), sound, colour, and such commands as ATTR, SCREEN$ and BRIGHT. From the co-ordinator of the National ZX Users' Club, Tim Hartnell. Just £6.95.

THE SPECTRUM SOFTWARE LIBRARY

60 GAMES AND APPLICATIONS FOR THE ZX SPECTRUM!

By David Harwood

Arcade games, intelligent board games, brain games and utility programs. They're all here in this massive collection of 60 tested programs for the Spectrum, compiled by Interface columnist David Harwood. Just £4.95.

Interface,
Dept.,YC
44-46 Earls Court Road, London, W8 6EJ
Please send me:

( ) PROGRAMMING YOUR ZX SPECTRUM–£6.95

( ) THE SPECTRUM SOFTWARE LIBRARY–£4.95

( ) A sample issue of INTERFACE, the monthly magazine published by the National ZX Users' Club–£1.00

I enclose £

Name ....

Address ....

BIGGER ★ BETTER

Buffer

MICRO SHOP

ZX81 · ZX SPECTRUM ·

DRAGON 32 · VIC-20 · BBC

The very best mail order items available "over the counter"

Games, Keyboards, Serious Programs, Rams, Books, Peripherals and much, much more!

FAST MAIL ORDER SERVICE PHONE **01-769 2887**
WITH ACCESS/VISA (24hr Ansafone)
or send large S.A.E. for catalogue (state which computer)

Open 10.30 — 5.30 Tues. to Sat. (closed Mondays)
310 STREATHAM HIGH ROAD, LONDON SW16

DON'T MISS THIS INCREDIBLE OFFER!

50 GAMES £9·95



YES, 50 GAMES!

on cassette for all the following:

GALACTIC ATTACK
SPACE MISSION
LUNAR LANDER
PLASMA BOLT
STARTREK
RADAR LANDING
ATTACKER
GALACTIC DOGFIGHT
ZION ATTACK
IVASIVE ACTION
OXO
BOGGLES
PONTOON
SKI-JUMP
HANGMAN
OLD BONES
THIN ICE
MAZE EATER
ORBITTER
MOTORWAY
FORCE FIELD
NIM
TUNNEL ESCAPE
BARREL JUMP
CANNONBALL BATTLE
OVERTAKE
SITTING TARGET
SMASH THE WINDOWS
SPACE SHIP
JET FLIGHT
PHASER
INTRUDER
INFERNO
GHOSTS
SUBMARINES
ROCKET LAUNCH
PLANETS
BLACK HOLE
DYNAMITE
DO YOUR SUMS
DERBY DASH
SPACE SEARCH
UNIVERSE
RATS
TANKER
PARACHUTE
JETMOBILE
HIGH RISE
THE FORCE
EXCHANGE

sinclair SPECTRUM
apple (ON DISC & CASSETTE)
ACORN ATOM
BBC
DRAGON
ATARI VIC 20
SHARP
ORIC-1
NEW BRAIN
ZX81 LYNX



POSTAGE FREE TO U.K. ORDER DIRECT TO:

U.T.S.
P.O. Box 96
HARROGATE
NORTH YORKSHIRE
HG3 2UZ

PLEASE SEND ME ____________
CHEQUE ENCLOSED, VALUE ________
NAME ____________
ADDRESS ____________
POSTCODE ____________ G/224

cut & post now

LEISUREMAIL

BRINGS YOU THE PICK OF THE GAMES!

GAMES - GAMES - GAMES! More and more computer games hit the market every month, BUT THEY CAN'T ALL BE GOOD. So - let LEISUREMAIL short list the VERY BEST for you. Send 50p NOW for our big 'BEST OF THE BUNCH' catalogue. We select TOP QUALITY SOFTWARE FOR YOUR ZX81 - SPECTRUM - BBC MICRO - GENIE 2 - VIC 20 - DRAGON 32 - ATARI etc.

SPECIAL THIS MONTH

New Generation **ESCAPE** for 16K Spectrum - voted by Sinclair User as 'best and most original game yet seen for Spectrum! Only £4.95 post paid. Simply amazing graphics. Also fabulous new release - **3D TUNNEL** - 16K and 48K versions for Spectrum on one tape - £5.95.

To:- LEISUREMAIL (YC), 69, Long Lane, London EC1A 9EJ.

Please rush me your BUMPER CATALOGUE of TOP FLIGHT GAMES. I enclose 50p (refundable first order).

I enclose £.......for....**ESCAPE** and/or......3D TUNNEL, plus free catalogue. OR debit my ACCESS/DINERS/AMEX account number ....

Name:- ....

Address:- ....

....

TI99/4A DRAGON 32

QUALITY SOFTWARE AT SENSIBLE PRICES

DRAGON 32

Order code	Title	Price
DG2	Caterpillar + Space Attack	£2.95
DG8	Arcade Action (Meteor Run + Breakout)	£3.95
DG4	Haunted House	£3.95
DG6	Forbidden City (adventure)	£4.95
DG10	Devil's Island (adventure)	£4.95
DG11	Goblin Caves (3-D graphics)	£4.95
DG12	Golf (hi-res. graphics)	£4.95

TEXAS TI99/4A

GM5	Haunted House + Wumpus	£3.95
GM6	Sorcerer's Castle + Lunar Lander	£3.95
GM7	3-D Maze + Towers of Hanoi	£3.95
GM17	Forbidden City + Mastermind	£4.95
GM18	Pharaoh's Curse + 3-D O's & X's	£4.95
GM19	Devil's Island + Russian Roulette	£4.95
GM20	Goblin Caves + Anagram	£4.95
GM21	Chalice of Kalmar + Penguin	£3.95

All prices include VAT. Please add 50p p&p to all orders under £6. Over £6 post free. Send cheque, P.O. or telephone with Access, Barclaycard for immediate despatch. Send s.a.e. for complete list, stating machine.

APEX TRADING LTD

115 Crescent Drive South
Brighton BN2 6SB
Tel: (0273) 36894

We welcome Access · VISA

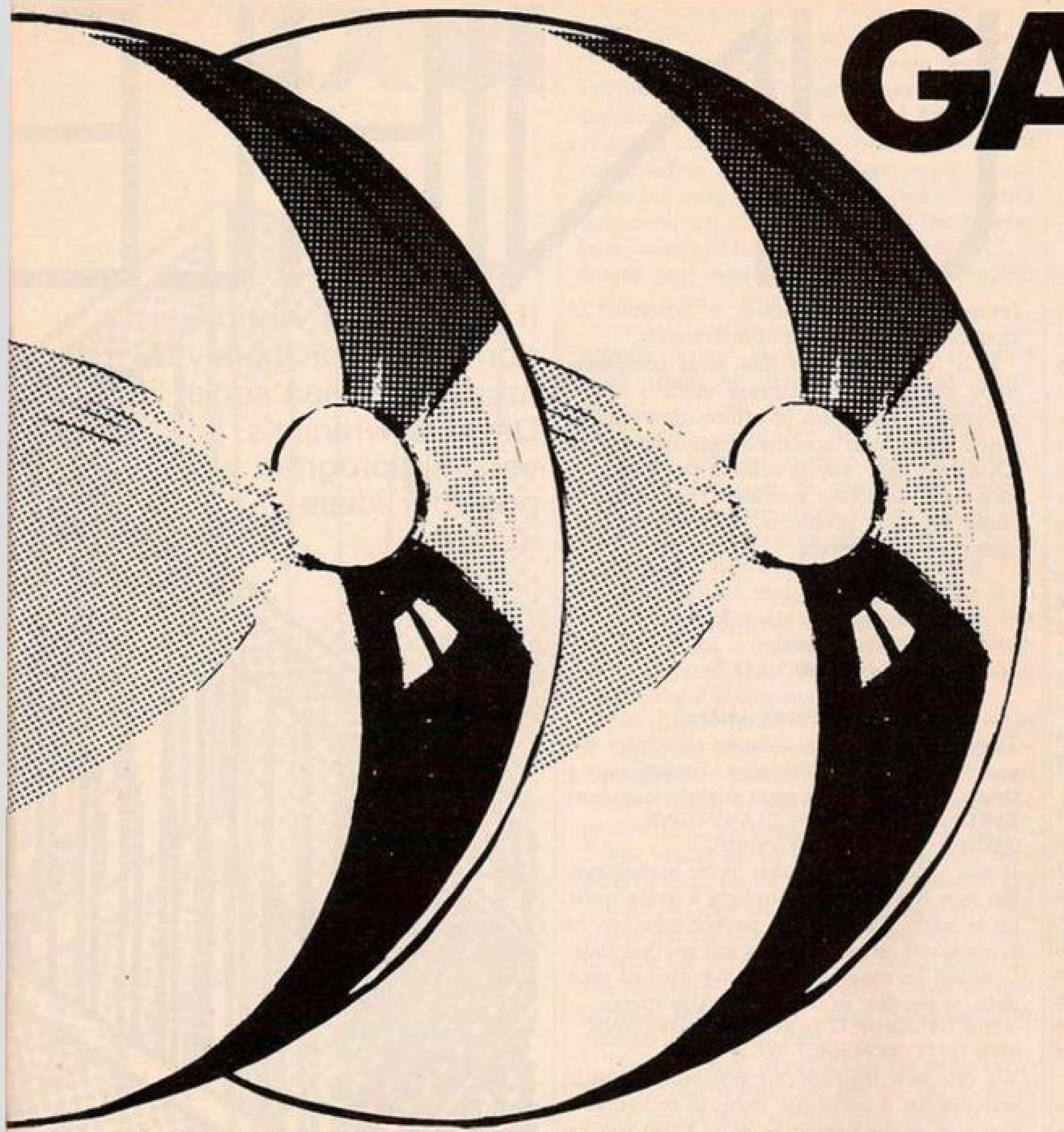
DEALER ENQUIRIES WELCOME

```
10 TIMER=0
20 GOTO320:CLS
30 A1=0
40 CLS:A=1056:Q=RND(7)+1
50 FORI=0TO62:SET(I,A1,Q):NEXT
60 FORI=0TO31:SET((A1*2)-(A1=31),I,Q):NEXT:IFA1=31
   THEN80
70 A1=31:GOTO50
80 L=1138:C=0:B=1:P=0:T=0:Y=48:X=TIMER
90 Z=INT(RND(448))+A+32
100 IFZ=L-B ORPEEK(Z)<>96 THEN90
110 Y=Y+1:POKEZ,Y
120 '
130 A$=INKEY$:IFA$="M" ORA$="Z" THEN270
140 K=PEEK(L+B):IFK<>96 THEN170
150 POKEL,96
160 L=L+B:POKEL,79:GOTO130
170 IF TIMER-X>3600 THEN490
180 IFK=Y ORK>111THEN230
190 C=SGN(B)*(33-ABS(B))
200 Z=87:IFK=111 THENC=-C:Z=43
210 SOUNDZ,1:IFPEEK(L+B+C)<>96 THEN150
220 POKEL,96:L=L+B:B=C:GOTO160
230 IFK=Y THEN250
240 B=-B:SOUND61,1:GOTO150
250 Z=225:FORJ=1TO9:SOUND390-Z,1:NEXT
260 T=T+1:GOTO90
270 C=SGN(B)*(33-ABS(B))
280 Z=78:IFA$="Z" THENC=-C:Z=38
290 IFPEEK(L+C)<>96 THEN150
300 POKEL,111+((A$="M")*19):SOUNDZ,1
310 P=P+1:B=C:GOTO160
320 CLS:PRINT@172,"REBOUND"
330 GOSUB600
340 PRINT:PRINT"    THE ULTIMATE GAME OF SKILL":GOSUB600
350 CLS:PRINT" YOU HAVE ONE MINUTE TO HIT AS"," MANY TARGETS AS
    YOU CAN BY
360 PRINT" PLACING PADDLES IN THE PATH OF";," THE BALL.
370 PRINT:PRINT"  PRESSING 'Z' GIVES YOU '/'
380 PRINT"             'M' GIVES YOU ' '":POKE1242,92
390 PRINT:PRINT" IF YOU USE TOO MANY PADDLES "," YOUR SCORE WILL BE
    REDUCED."
400 PRINT@456,"PRESS ANY KEY"
410 GOSUB610
420 CLS:PRINT" YOU WILL NOT BE ABLE TO HIT ",,," TARGETS WHEN VERY
    CLOSE AND
430 PRINT:PRINT" UNWANTED PADDLES AND TARGETS ",,," MAY BE ERASED"
440 PRINT:PRINT" TO PLAY:-",,,,"  SELECT 'A' FOR AMATEUR",,"
    'P' FOR PROFESSIONAL
450 PRINT:PRINT"              'N' TO END
460 GOSUB610:IFA$<>"A" ORA$<>"P"THENGOSUB610
470 IFA$="P" THENPOKE65495,0:GOTO30
480 IFA$="A" THEN30
```



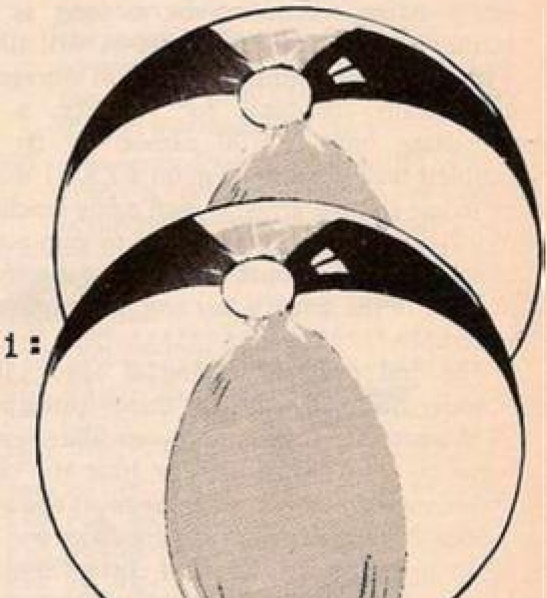
DRAGON

GAMES



You'll have to be fast off the mark to master Vincent Crockett's original game for the Dragon 32. Your quick reflexes come into play as you set the paddles which will send the ball racing towards a new high score. Your targets are the randomly-generated numbers that appear scattered over the screen. Full instructions are included in the program itself. Because Rebound uses Poke locations to increase speed of play, you must finish each game properly and not just stop using the Break key. Remember: you have only one minute per game and if you use too many paddles, your score will be reduced.

```
490 FORZ=250TO4 STEP-6:SOUNDZ,1:NEXT
500 POKE65494,0
510 PRINT@108,"GAME OVER";
520 GOSUB600
530 CLS:PRINT@39,"YOU HIT";T;"TARGETS
540 PRINT@102,"YOU USED";P;"PADDLES
550 S=INT(8000*T/(P+70))/10
560 PRINT@166,"YOUR SCORE IS";S;"%"
570 IFS>HS THENHS=S:Z=200:FORJ=1TO9:Z=350-Z:SOUNDZ,1:
    PRINT@224:PRINT@234,"its a record":FORZ1=1TO30:
    NEXT:NEXT
580 PRINT:PRINT"        HIGH SCORE IS";HS;"%"
590 GOSUB600:GOTO440
600 FORI=1TO2000:NEXT:RETURN
610 A$=INKEY$:IFA$=""THEN610
620 IFA$="N" THENEND
630 RETURN
```



REBOUND

ZX UNIFILE

If your aim is world domination or merely a more organised social life, David Lawrence's versatile program will put your ideas in order.

ONE OF THE dreams that accompanies most micros into the home is the vision of massive information storage. Within weeks, every recipe will be stored, every cheque and bill recorded, phone numbers available at the mere touch of a button. Even if the dream does not turn into a nightmare, it usually fades for two reasons: first, for a great many purposes, the amount of benefit to be gained from putting information on to a micro simply does not justify the amount of work needed to program it in or to retrieve it; and secondly, large masses of information have a nasty habit of resisting all attempts to process them or present them in an orderly fashion — it is all very well storing the whole of the telephone directory on your micro but how do you actually persuade the thing to tell you what you want to know?

The program accompanying this article is directed at 16K ZX-81 owners who have decided that they do want to use their machines for information storage and retrieval but have run up against problems in practice. The system is called Unifile and it is, basically, an empty filing cabinet waiting to be filled with information which it will arrange according to instructions laid down by the user and, equally important, retrieve and display information or amend it.

The Unifile program stores its data in a single string which can be as long as the memory of your expanded ZX-81 will allow. This is not the simplest method of storage by any means. Imagine, for instance, a file consisting only of 100 names. By far the simplest way to store them on a ZX-81 would be to use a string array — each name would be in a clearly definable place and to gain access to any name you would have only to specify its number in the array, a fast and uncomplicated technique.

The real problem is one of space. It is unlikely that you will have many names with 20 characters in them, but if your filing system is not to break down the first time you come across such a name, your array must allow for at least 20 charactes — a 100 by 20 array. The result is that every time you enter "Smith, J H" you have wasted an enormous amount of space in your memory because even with the punctuation you only needed 10 characters of the 20 you have set aside in the array.

If all you have to worry about is one hundred, or even two or three hundred names, then do put them into an array. But what if you wish to add details to the names, so that for each name entered into the file there may be five or six other items of information, all of which will require a space allocation in the array. Space enough in the memory for three hundred names now becomes space enough for only 50 names with their attendant details, assuming that you allow a possible 20 characters for each item of information.

It is for this reason that most computer-filing systems use a storage method which allocates to each item of information only as much space as it actually needs and on the ZX-81 the only way to achieve this end is to pack each item into a string. The technique raises its own problems, as the following example will illustrate.

Name: Smith
C/name: John
Address: 12 North St
Town: Anytown
Phone: 0998-11111
Age: 35
Interests: Ferret washing

This is a typical entry from an imaginary file and is fairly self-explanatory. Packed into a string, however, it becomes slightly less clear:

SMITHJOHN12 NORTH STANYTOWN
0998-1111135FERRET WASHING

It may still be decipherable to the human eye, but how is a program searching a string made up of many such entries, packed together, to know where one item begins and another ends. It would be much clearer if we marked each item, at the cost of very little extra space:

+SMITH*JOHN*12 NORTH ST*ANYTOWN*
0998-11111*35*FERRET WASHING+

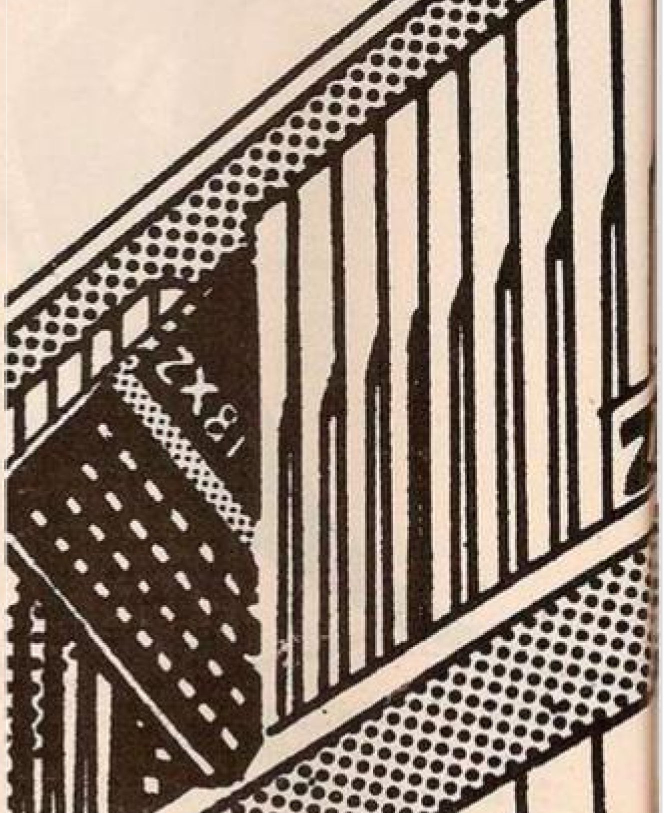
We can now instruct our program, when it searches for a particular item, to recognise a plus sign as the beginning of an entry and an asterisk as marking individual items within that entry. Unfortunately such separator symbols can only be recognised if the string of information is examined character by character, which is fine when you are dealing with only a few entries but a little on the slow side if your file has grown to around 10,000 characters.

Some method is needed which allows the program to identify the beginning and end of an entry without examining every character in the file. The Unifile program achieves this by attaching to each entry a special indicator called a "string length indicator", or SLI.

In the case of a small system such as Unifile, the SLI does not need to be able to cope with huge entries and it is, in fact, one character whose Code value is the length of the whole entry.

This limits the length of each entry to 255 characters, or approximately five times as much information as was stored in our specimen entry, which has been found in practice to be adequate.

While the Unifile program cannot jump to the middle of its stored data and unerringly identify the beginning of an entry, using the SLIs it can quickly scan along its files, jumping from one entry to the next at an acceptable speed. A typical Unifile entry would be structured as follows:



a) an SLI recording the length of the whole entry
b) an SLI recording the length of item 1
c) item 1
d) an SLI recording the length of item 2
e) item 2
f) an SLI for the next entry etc.

The Unifile program provides five facilities necessary to operating a useful storage and retrieval system: file structuring, information entry, amendment, search and display. First of all, file structuring. In the specimen entry given above, seven items of information were

ZX-81



recorded about John Smith. The Unifile system allows any number of named items to be specified and any information retrieved later will be reproduced under the specified headings. The only limitation here is that the whole entry must not exceed 255 characters.

As to entry of information, once the types of information to be recorded in each entry have been specified, the program requests entries on the basis of the structure the user has laid down. Entries will be stored in alphabetical order of the first item.

Using the amendment function, individual items can be changed or whole entries deleted.

Two types of search function are provided. For the purposes of a normal search the user specifies an item to be searched for and the program compares this with each item contained in its files. However, only whole items are compared — a normal search would only come up with John Smith if the address being searched for were "12 North Street", it would pass over the entry if the specified address were simply North Street.

Special search, on the other hand, will identify every occurrence of a specified combination of characters such as North Street, or even 'Nor'. Special search is particularly useful for files which do not follow an orderly structure, such as recipes, where it may not be possible to predict precisely how many items of information will be needed and two or more end up being lumped together under the same heading. The disadvantage of special search is that it is considerably slower than normal search. For either form of search, when the specified item is discovered, the whole of the entry containing it is displayed.

The display function displays entries one at a time on command. All the program's functions are called simply from a menu section which is displayed on entry to the program and at relevant points during its use.

The beauty of the Unifile idea is that, once entered on to your ZX-81 and recorded on to a cassette, its uses are endless. A single user can, at one and the same time, be using one version to store his personal address book, with only two or three items per entry, while another version stores vastly more complex club records or business data.

The one major drawback of the program as listed is that it still does not use the memory space available as efficiently as possible — in fact it uses only half the space the ZX-81 would allow. The reason for this is that we have referred to our data storage string on both sides of a string equation, as in line 730. Upon encountering this instruction the ZX-81 promptly sets up a copy of B$ in order that it may maintain a distinction between the new B$ that it is being asked to create and the old B$ it is being asked to use as material. This problem can only be avoided by fixing the length of B$ in the memory of the ZX-81 and working within that fixed length.

The method of doing this, outlined in the supplementary program notes, requires more program lines and is slightly slower in execution. This is because, instead of the economy of line 730, we have now to move B$ in blocks whenever we wish to insert or remove data from the file. This version of the program should only be used, therefore, if you are likely to exceed 4K characters in your intended file. In order to use the second version, B$ must be dimensioned when the file is about to be set up. The maximum length is between 9000 and 9500 characters and to set up a new file simply enter DIM B$(9000) in direct mode, followed by Goto 1. Other than that there is no difference in operation.

395 Size is the variable used to store the number of characters so far recorded in B$.

632 These extra lines check to see whether B$, which is now of fixed length, will be overfilled by the current entry.

730 These two Gosubs replace the sections which added data or subtracted it from B$.

1170 We cannot now use the length of B$ as an indicator that the end of the data has been passed in a search, since no matter how little data is recorded, the length of B$ is static.

1255 This line and 1320 use the spurious entry, inserted into the file when it was first set up, in order to detect the end of the file.

1860 This section — down to 1930 — uses an intermediate string — S$ — to move blocks of B$ up the string, in order to make room for more data. Since B$ does not appear on both sides of a string equation any longer, it is not duplicated in the memory. Slightly more memory can be made available for storage by reducing the value of SHIFT in line 1860 and 1950, though this slows the program down.

1940 This section telescopes the file when an entry is removed and is simply the opposite of the previous section.

```
   1 GOTO 5
   2 SAVE "UNIFIL▮"
   3 STOP
  40 PRINT "          [illegible]
"
  50 PRINT ,,"FUNCTIONS AVAILABL
E:"
  60 PRINT ,,"          1)SET UP STRU
CTURE OF FILE."
  70 PRINT ,,"          2)ENTER INFOR
MATION."
  80 PRINT ,,"          3)SEARCH/DISP
LAY/CHANGE."
  90 PRINT ,,"          4)STOP."
 100 PRINT ,,,,"PLEASE ENTER WHI
CH YOU REQUIRE."
 110 SLOW
 120 INPUT Z
 130 CLS
 140 IF Z=1 THEN GOSUB 250
 150 IF Z=2 THEN GOSUB 420
 160 IF Z=3 THEN GOSUB 1030
 170 IF Z=4 THEN GOSUB 200
 180 CLS
 190 GOTO 40
 200 PRINT AT 10,5;"[illegible]
[illegible]"
 210 PRINT ,,"    *PLEASE RE-RECO
RD IF NEW"
 220 PRINT " INFORMATION HAS BEE
N ENTERED*"
 230 STOP
 240 REM ************************
 250 REM ENTRY STRUCTURE
 260 REM ************************
 270 PRINT AT 0,8;"[illegible]
▮"
 280 PRINT ,,"HOW MANY ITEMS IN
EACH ENTRY?"
 290 INPUT X
 300 CLS
 310 DIM A$(X,20)
 320 PRINT AT 0,6;"[illegible]
▮"
 330 FOR I=1 TO X
 340 PRINT "ITEM ";I;":";
 350 GOSUB 1570
 360 PRINT Q$(2 TO )
 370 LET A$(I)=Q$
 380 NEXT I
 390 LET B$="  *"+CHR$ (255)
 400 RETURN
 410 REM ************************
 420 REM NORMAL INPUT
 430 REM ************************
 440 LET R$=""
 450 PRINT AT 0,10;"[illegible]"
 460 PRINT ,,"COMMANDS AVAILABLE
:"
 470 PRINT ,,,">ENTER ITEM SPECIF
IED",,,"> ""ZZZ"" TO QUIT FUNCTI
ON"
 480 PRINT "*************************
************"
 490 FOR I=1 TO X
 500 GOSUB 1600
 510 GOSUB 1570
 520 PRINT Q$(2 TO )
 530 IF Q$=" ZZZ" THEN RETURN
 540 LET R$=R$+Q$
 550 NEXT I
 560 CLS
 570 LET R$=CHR$ (LEN R$+1)+R$
 580 GOSUB 610
 590 GOTO 420
 600 REM ************************
 610 REM PLACE DATA IN FILE
 620 REM ************************
 630 FAST
 640 LET C=2
 650 LET C1=C+1
 660 DIM C$(100)
 670 LET D$=C$
 680 LET D$(1 TO CODE R$(2)-1)=R
$(3 TO 1+CODE R$(2))
 690 LET C$(1 TO CODE B$(C1)-1)=
B$(C1+1 TO C1+CODE B$(C1)-1)
 700 IF D$<C$ THEN GOTO 730
 710 LET C=C+CODE B$(C)
 720 GOTO 650
 730 LET B$=B$(1 TO C-1)+R$+B$(C
TO )
 740 SLOW
 750 RETURN
 760 REM ************************
```

ANIROG SOFTWARE

KRAZY KONG — **16K VIC 20**
All the thrills of the arcade game have been brought to life on this expanded screen, extra large characters and multi-screen presentation. Rolling barrels, hammer etc. are featured in the action inside King Dong's lair as you try to rescue the boy he has abducted. K.B./J.S. £6.

ZOK'S KINGDOM — **16K VIC 20**
An afternoon stroll turns into a nightmare. A footslip and you fall down the biztual hole leading to the middle earth kingdom of ZOK. A harsh and cunning ruler by any standards. You are challenged to a battle of wits and endurance as the battle for survival starts in earnest. K.B. £6

DRACULA — **3K VIC 20**
Count Dracula is asleep somewhere in his castle. He rises at mid-night and you must find him and drive a stake through his heart before he rises. A multi-screen graphic adventure. K.B. £6.

HOPPER — **16/48K SPECTRUM**
SPECTRUM version of FROGGER with same features and brilliant graphics. K.B. £6.

PHARAOH'S TOMB — **16K VIC 20**
A graphical adventure game set in a pyramid. Once you enter, the only way out is with the aid of a key which unlocks the mystery of the Pharao's tomb. Beware of the mantraps the ancient Egyptians so painstakingly built. One false move and you will meet the same fate as befell other tomb robbers over thousands of years.

FROGGER — **UNEXP. VIC 20**
Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs K.B./J.S. £6

CAVERN FIGHTER — **UNEXP. VIC 20**
All M/C version of SCRAMBLE. Lasers, bombs, continuous scoring and sound effects give all the thrills of arcade game. Pilot your space ship through the tortuous tunnels and caverns destroying enemy missile launchers, fuel dumps and airborne fire saucers. Four ships to complete mission. 10 skill levels. K.B./J.S. £6

CRAWLER — **UNEXP. VIC 20**
Armed with a laser gun, you must destroy the centipede. Destroy his mushroom cover and his allies mushroom laying flea and the homing spider. Fast and furious game. J.S. £6.

SEVEN PROGRAMS (VOL 1) — **UNEXP. VIC 20**
This exciting collection of seven games, all in Hi-Res graphics include popular board game Othello plus Bomber, Slalom, Bounce Out, Snake, Memory and Lunar Docker. K.B. £6.

SEVEN PROGRAMS (VOL 2) — **UNEXP. VIC 20**
This pack with all games in Hi-Res graphics contains graphical adventure game Goblin's Gold plus Ghosts, Breakout, Dare Devil, Minefiled, Grand Prix and Cobra. K.B. £6.

TINY TOTS SEVEN — **UNEXP. VIC 20**
Seven games for young children. All games are in Hi-Res graphics with bright graphics. The games include Super Snap, Simon, Bombs Away, Noughts and crosses, Duck Shoot, Mad Drivers and Santa. K.B. £6



GENEROUS DEALERS DISCOUNT AVAILABLE

AREA AGENCIES AVAILABLE.

SOFTWARE WRITERS
We are looking for top class writers to join our growing software team. If you have written a quality game for VIC 20, SPECTRUM, DRAGON 32, ORIC 1 or COMMODORE 64, then contact us. We pay top royalties for accepted programmes.

ANIROG AT CO-OP CRAWLEY

Huge selection of software and Computer Books for
SPECTRUM — ZX81 — VIC 20 — DRAGON 32 — COMMODORE 64
Most of the software and add-on's advertised in this magazine for these computers available across the counter.
Manufacturer's appointed dealers for **DRAGON 32 — VIC 20 — COMMODORE 64 and ORIC** home computers. We stock full range of peripherals (disc drives, printers and memory expansions) and support software. Come and see us for expert advice and comprehensive service.

MAIL ORDER
ANIROG COMPUTERS
26 BALCOMBE GARDENS
HORLEY SURREY

Access — BARCLAYCARD VISA

Payment By Cheque/
P.O./Access or Visa
CREDIT CARD SALES
HORLEY (029 34) 6083/ 2007

(continued from page 67)

```
 770 REM CHANGE ENTRY
 780 REM **********************
 790 LET C2=C2-1
 800 LET C1=C+1
 810 LET R$=""
 820 PRINT "ENTRY ";C2;":-"
 830 FOR I=1 TO X
 840 GOSUB 1600
 850 GOSUB 1620
 860 PRINT AT 17,12;"AMEND"
 870 PRINT "COMMANDS AVAILABLE:"
 880 PRINT ">NEWLINE LEAVES ITEM
UNCHANGED",">""ZZZ"" DELETES WH
OLE ENTRY",">ENTER NEW ITEM"
 890 GOSUB 1570
 900 IF Q$="■" THEN LET R$=R$+B$
(C1 TO C1+CODE B$(C1)-1)
 910 LET C1=C1+CODE B$(C1)
 920 CLS
 930 IF Q$="■" THEN GOTO 960
 940 IF Q$="▪ZZZ" THEN GOTO 970
 950 LET R$=R$+Q$
 960 NEXT I
 970 LET B$=B$(1 TO C-1)+B$(C+CO
DE B$(C) TO )
 980 IF Q$="▪ZZZ" THEN RETURN
 990 LET R$=CHR$ (LEN R$+1)+R$
1000 GOSUB 610
1010 RETURN
1020 REM **********************
1030 REM SEARCH
1040 REM **********************
1050 LET C=2
1060 LET C4=0
1070 LET C2=1
1080 PRINT AT 0,14;"SEARCH"
1090 PRINT ,,"COMMANDS AVAILABLE
:"
1100 PRINT ">INPUT ITEM FOR NORM
AL SEARCH",">PRECEDE WITH ""SSS"
" FOR","SPECIAL SEARCH",,">PRECE
DE WITH ""III"" TO SEARCH","FOR
1ST CHARACTER OF ENTRY"
1110 PRINT ">NEWLINE FOR 1ST ITE
M ON FILE"
1120 PRINT "********************
***********"
1130 PRINT ,,"INPUT SEARCH ITEM:
":
1140 GOSUB 1570
1150 LET S$=Q$
1160 IF S$="■" THEN GOTO 1310
1170 IF C+2=LEN B$ THEN RETURN
1180 FAST
1190 LET C1=C+1
1200 IF LEN S$<4 THEN GOTO 1240
1210 IF S$(2 TO 4)="SSS" THEN GO
SUB 1730
1220 IF S$(2 TO 4)="III" THEN GO
SUB 1730
1230 IF C4=1 THEN GOTO 1310
1240 FOR I=1 TO X
1250 IF B$(C1 TO C1+CODE B$(C1)-
1)=S$ THEN GOTO 1310
1260 LET C1=C1+CODE B$(C1)
1270 NEXT I
1280 LET C=C+CODE B$(C)
1290 LET C2=C2+1
1300 GOTO 1170
1310 LET C1=C+1
1320 IF C+2=LEN B$ THEN RETURN
1330 CLS
1340 SLOW
1350 PRINT "ENTRY ";C2;":-"
1360 GOSUB 1640
1370 LET C2=C2+1
1380 PRINT AT 16,12;"SEARCH"
1390 PRINT "COMMANDS AVAILABLE:"
1400■PRINT ">NEWLINE TO DISPLAY
NEXT ITEM",">""ZZZ"" TO QUIT FUN
CTION",">""AAA"" TO AMEND",,">""
CCC"" TO CONTINUE"
1410 INPUT P$
1420 CLS
1430 IF P$="CCC" THEN GOTO 1170
1440 IF P$="" THEN GOTO 1310
1450 IF P$<>"AAA" THEN GOTO 1510
1460 LET C=C-C3
1470 LET C4=C
1480 CLS
1490 GOSUB 770
1495 LET C2=1
1500 LET C=2
1510 IF P$="ZZZ" THEN RETURN
1520 CLS
1530 GOTO 1170
1540 REM **********************
1550 REM FUNCTIONAL SUBROUTINES
1560 REM **********************
1570 INPUT Q$
1580 LET Q$=CHR$ (LEN Q$+1)+Q$
1590 RETURN
1600 PRINT A$(I,2 TO CODE A$(I,1
));":";
1610 RETURN
1620 PRINT B$(C1+1 TO C1+CODE B$
(C1)-1)
1630 RETURN
1640 FOR I=1 TO X
1650 GOSUB 1600
1660 GOSUB 1620
1670 LET C1=C1+CODE B$(C1)
1680 NEXT I
1690 LET C3=CODE B$(C)
1700 LET C=C+CODE B$(C)
1710 RETURN
1720 REM **********************
1730 REM SPECIAL SEARCH
1740 REM **********************
1750 LET C4=0
1760 FOR J=C+2 TO C+CODE B$(C)-L
EN S$+5
1770 IF S$(2 TO 4)="III" AND J>C
+2 THEN GOTO 1820
1780 IF B$(J TO J+LEN S$-5)<>S$(
5 TO ) THEN GOTO 1810
1790 LET C4=1
1800 RETURN
1810 NEXT J
1820 RETURN
```

Two subroutines to be added.

```
1830■REM **********************
1840 REM MOVING DATA
1850 REM **********************
1860 LET SHIFT=512
1870 FOR I=LEN B$-LEN R$ TO C ST
EP -SHIFT
1880 IF I-SHIFT<C THEN LET SHIFT
=I-C
1890 LET S$=B$(I-SHIFT TO I)
1900 LET B$(I-SHIFT+LEN R$ TO I+
LEN R$)=S$
1910 NEXT I
1920 LET B$(C TO C+LEN R$-1)=R$
1930 RETURN
1940 FAST
1950 LET SHIFT=512
1960 LET SIZE=SIZE-CODE B$(C)
1970 FOR I=C+CODE B$(C) TO LEN B
$ STEP SHIFT
1980 IF LEN B$-I+1<SHIFT THEN LE
T SHIFT=LEN B$-I+1
1990 LET S$=B$(I TO I+SHIFT-1)
2000 LET B$(C TO C+SHIFT-1)=S$
2010 LET C=C+SHIFT
2020 NEXT I
2030 RETURN
```

These lines complete the change.

```
 390 LET B$(1 TO 4)=" ▪■"+CHR$ (
255)
 395 LET SIZE=5
 485 PRINT "FILE SIZE:";SIZE;"/"
;LEN B$
 632 LET SIZE=SIZE+LEN R$
 634 IF SIZE<=LEN B$ THEN GOTO 6
40
 636 PRINT AT 14,10;"FILE NOW FU
LL"
 638 LET SIZE=SIZE-LEN R$
 639 RETURN
 730 GOSUB 1860
 970 GOSUB 1940
1170 REM DELETE THIS LINE
1255 IF B$(C1 TO C1+CODE B$(C1)-
1)="■ COPY " THEN RETURN
1320 IF B$(C1 TO C1+CODE B$(C1)-
1)="■ COPY " THEN RETURN
```

■

Every computer needs a

CHATTERBOX!

"OK Spock, you win *this* time....

NEW!

SAVE £££s ONLY £49

for

ZX81
SPECTRUM

NASCOM, VIC, PET, BBC, APPLE, TRS80, IBM, CRAY, ETC. (Please state)



At last! Genuine phonetic synthesis at a sensible price. Gives your computer an *unlimited* vocabulary (nothing more to buy!). Self contained speaker/amplifier, Sinclair connector etc, **PLUS** Expansion socket for BIG EARS **AND** Monitor socket for Music Board. Full instructions, technical notes and programme examples supplied with this outstanding educational unit.

OR COMPLETE D.I.Y KIT £39

DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

BIG EARS

STOP! GO! LEFT! RIGHT!

SPEECH INPUT FOR ANY COMPUTER



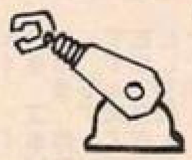
Hugely successful Speech Recognition System. complete with microphone, software and full instructions.
BUILT TESTED & GUARANTEED ONLY **£49**
PLEASE STATE COMPUTER: UK101, SPECTRUM, ATOM, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, MZ80K, APPLE II, BBC MICRO

NEW: FAST MACHINE CODE FOR ZX81/SPECTRUM £7.40

ZX81/SPECTRUM



MUSIC SYNTHESISER (STEREO)
+ 16 LINE CONTROL PORT



Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway etc. etc. Works with or without 16K RAM.

Add keyboard to make a live performance polyphonic synthesiser! Full instructions/software included.

AMAZING VALUE AT ONLY £19.50 (KIT)
Extra 23 way connectors at £2.60
£25.50 (BUILT)

THE COMPOSER



Music Programme for above synthesiser.
Enter and play 3 part harmony.
Includes demonstration tunes. Recommended £7.40

COLOUR MODULATOR	**KIT £15**
RGB in, PAL/UHF out (not for ZX)	**BUILT £20**

SPECIAL OFFER	**I.C. £18**
SPEECH OUTPUT CHIP SX-01	
Phoneme Speech Processor	**DATA £0.60**

Please add VAT at 15% to all prices.
Barclay/Access orders accepted by telephone

All enquiries S.A.E. please

WILLIAM STUART SYSTEMS Ltd
44, Bedford Gardens, Kensington, London W8 7EH.
Tel: 01-221 1131 (Sorry — no callers)

ZX81 GAMES
from
J.K. GREYE SOFTWARE LTD

PLEASE NOTE

As from March 31st the ZX81 games currently available from this company will be marketed solely by two separate companies as follows:

GAMESTAPE 1
10 games for 1K
GAMESTAPE 2
Starfighter, Artist, Pyramid
GAMESTAPE 3
Catacombs

From:
J.K. Greye Enterprises
16 Park Street, Bath

GAMESTAPE 4
3D Monster Maze
GAMESTAPE 5
3D Defender
GAMESTAPE 6
Full Screen Breakout for 1K

From:
New Generation Software
16 Brendon Close
Oldland Common, Bristol

ANY ENQUIRIES CONCERNING THE ABOVE GAMES SHOULD BE MADE TO THE RESPECTIVE COMPANIES.

VIC 20

LASER ZONE NEW J

An utterly new, totally original masterpiece of video games design. Learn to control 2 spaceships at once. Feel the raw power as you lunge for the electro button and blast your enemies into expanding clouds of space junk. Feel the humiliation as a carelessly aimed blast slams into the side of your last remaining ship! Requires 8 or 16K and DEDICATION. **£6.00 + P&P.**

ABDUCTOR J

A classic new space game! ZAP the swirling alien hordes before they ram you — and abduct your humanoids! Survive the assault for long enough and you'll get an extra stage on your spaceship with double firepower! Awesome unexpanded Vic Action. **£6.00 + 50p P&P.**

GRIDRUNNER J

Finally, true arcade quality on the unexpanded VIC! Shoot down the segmented DROIDS invading the grid. Beware of the pods and zappers! The awsome speed, sound and graphics gives you the best blast available for unexpanded Vic. **£6.00 + 50p P&P.**

ANDES ATTACK (8K) J

Your spacecraft must attack the descending aliens and frustrate their evil intent. Fly your Ramjet fighter over the Andes mountain range and protect your llamas from kidnap by hostile UFOS. Features 5 kinds of UFO, controls include up, down, reverse, fire, thrust and smart bomb. Entirely in machine code. Requires 8K expansion and joystick. **£8.00 + 50p P&P.**

TRAXX M/C (8K + EXPANSION) J

This is VIC 20 cross breed between the now famed 'Packman' and the game 'Quix'. All in machine code, fast and fun with joystick controls, uses Hi-Res colour graphics. 8K or larger expansion needed. **Only £6.00 + 50p P&P complete with instructions.**

THE VERY FIRST COMMODORE 64 GAMES

ATTACK OF THE MUTANT CAMELS J

Planet earth needs you! Hostile aliens have used genetic engineering to mutate camels from normally harmless beasts into 90 foot high, neutronium shielded, laser-spitting death camels!! Can you fly your tiny, manoeuvrable fighter over the mountainous landscape to weaken and destroy the camels before they invade the human stronghold! You must withstand withering laser fire and alien UFOs. Game action stretches over 10 screen lengths and features superb scrolling, scanner, 1/2 player actions and unbelievable animation! Play this game and you'll never be able to visit a zoo again without getting an itchy trigger finger! Awesome m/c action! **£8.50 + 50p P&P.**

ROX-64

Rox is a challenging game involving the defence of your lunar base from a deadly meteor shower. Rox-64 includes amazing sprite graphics displays and spacy sound effects, and an awesome 'mothership' display if you win the game. Top 10 scores are tabled along with their names. This program shows just what can be achieved using only Commodore-64 basic. Study the listing and learn how to use sprites and sound on this outstanding machine. **£4.95 + 50p P&P.**

GRIDRUNNER 64 J

The No. 1 best game for the Vic has been improved for your COMMODORE 64! Gridrunner is a smash hit in the USA. Now experience the lightning-fast challenge of the grid on the 64. Features 31 skill levels and excellent sound and graphics. Sore trigger finger *free* with every game! **£8.50 + 50p P&P.**

SPECTRUM

GRAPHICS CREATOR (16K)

Not just another character editor! Allows you to define not only the 21 user definable characters. Also allows you to change the entire 96 character ASCII set. Creates BYTES files ready for you to load into your own programs. Includes advanced Reflect, Invert, Field commands etc. Complete with full documentation. Bin the BIN statement and use Graphics Creator with its easy on-screen cursor editing. **£2.95 + 50p P&P.**

BOMBER (16K)

Yes, a full feature version of the popular game 'Blitz', supplied for the 16K or 48K Spectrum. **For only £2.95 + 50p P&P.**

HEADBANGER (48K)

Colourful new game starring Chico the headbanger who you must guide to riches through an increasing shower of heavy metal. Gain bonuses for headbanging but be sure to take an aspirin when the pain gets too much! Basic + m/c to speed up action. Great graphics, nice animation. Will even drive William Stuart system's voice synthesiser to produce speech output. Can you attain the grade of 'Rocker Class One' or will you be "Barry Manilow Class 5"? Start headbanging to-day and find out. **£4.95.** NEW

SUPERDEFLEX (48K)

Bounce 'Sid', the space invader, around the screen into the power pods, keeping away of course from the devil who chases you around the screen. Steer with your Deflex shields, but beware the mines or you may be buried alive! Superb graphics and fantastic sound on the 48K Spectrum only. **Only £4.95 on cassette + 50p P&P.**

ATARI 400-800

GRIDRUNNER NEW J

Now play the best selling VIC/C64 game on your ATARI 400/800. Any memory size (16-48K). Basic cartridge *not* required — 100% machine code autoboot tape. Play this awesomely fast and addictive game on your Atari. **For only £8.50.**

TURBOFLEX

Superb ultra-fast and totally new ball game. Uses ATARI's unique features to the full. Incorporates superb colour/sound effects and uses Player/Missile graphics. Tables top 10 scores along with Scorer's name. **£6.00+50p P&P.**

ZX81

CENTIPEDE (16K)

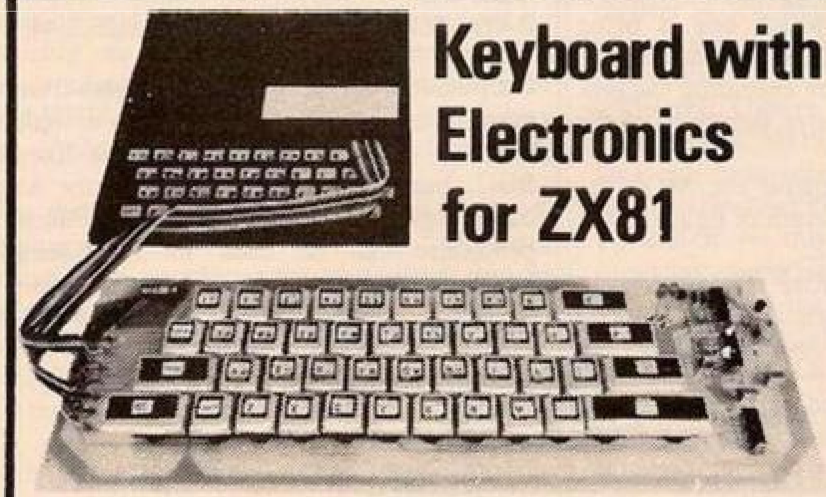
the ORIGINAL game from the ORIGINAL author. This is the identical program to that being sold by other companies for three times our price. The game has received ecstatic reviews in the computing press. Program has 30 speed levels and ever increasing Centipede hordes. Tables top 10 scores and names. Why wait to pay more? **Only £1.95 + 50p P&P.**

Please add 50p P&P with all orders

LLAMASOFT SOFTWARE



Dept. YC
49 Mount Pleasant,
Tadley, Hants
RG26 6BN.
Tel: 07356-4478
Trade enquiries welcome.



Keyboard with Electronics for ZX81

A full-size, full-travel 43-key keyboard that's simple to add to your ZX81 and requires no soldering in the ZX81.

Complete with the electronics to make "Shift Lock", "Function", and "Graphics 2" single key selections making entry far easier.

Powered from ZX81's own standard power supply–with special adaptor supplied.

Two-colour print for key caps.

Amazing low price for complete build-it-yourself kit, only **£21.90** incl. VAT and carriage	Order As LW72P
Moulded Case **£4.95**	Order As XG17T
Built and tested, in case **£29.95**	Order As XG22Y
Full details in Maplin Project Book 3. Price 70p	Order As XA03D

MAPLIN Electronic Supplies Ltd

P.O. Box 3, Rayleigh, Essex SS6 8LR. Tel (0702) 552911

Retail shops at
159 King St., Hammersmith, London W6. Tel 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel (0702) 554000
Lynton Square, Perry Barr, Birmingham. Tel: (021) 356 7292
(Shops closed Mondays). All mail to Rayleigh address.

A WEEK WITH A COMPUTER FOR JUST £120!

An instructional and entertaining Computer Programming holiday is now available from the YHA — for both child and adult home computer users.

During the seven-night holiday you will learn (or develop your knowledge of) BASIC, and write programs for Sinclair Research's new 48K Spectrum personal computer. Various software packages will also be available for your use.



ADVENTURE YHA HOLIDAYS

Fill in the coupon and send it now for full details of YHA Adventure Holidays 1983.

To: YHA Adventure Holidays, Trevelyan House, St Albans, Herts. Tel: (0727) 55215

Please send me details of YHA Adventure Holidays 1983.

NAME: ....

ADDRESS: ....

....

....

.... POSTCODE ....

TEL. NO: ....

BBC

Chris Melville plunges into the BBC's MOS — the handy machine-code routines already inside the Micro.



DIG INTO OPERATING SYSTEM

LAST MONTH I looked at the machine-level programming of the BBC using its assembler. This month I will deal with the useful machine-code routines already inside the firmware of the machine — that is, the Machine Operating System or MOS.

There are several slightly differing operating systems available, each one an improvement on the last. To identify your operating system, type:

```
*FX 0
```

and then press Return.

Operating systems around at the moment include the OS 0.1 — the first issue and the most common, sadly bug-ridden and lacking several important features such as the ability to drive discs, support extra paged ROMs, receive data on the RS-423 port and several important input-output routines. The OS 1.0 is a revision of 0.1, and can handle discs, paged ROMs, RS-423 reception, and has a full complement of system routines, although there are still some minor bugs.

There were then various issues with minor differences until the OS 2.1 — the one now being put on ROM. This features all the features of 1.0 as well as some useful new graphics routines to be used as starting points for sophisticated shape-filling algorithms. These will be incorporated into Issue 2 Basic as an extra set of Plot commands.

When referring to the MOS, I will be referring to OS 0.1 since this is compatible with the rest in most respects. I will point out any differences as I go.

The operating system of the BBC computer is a set of routines which control the input-output and housekeeping functions of the micro. These include VDU drivers for printing, plotting — that is, everything that can be performed by the VDU function in Basic; sound-chip management — the routines that control the operation of the sound chip as specified in Basic Sound and Envelope statements; cassette filing system operations; and keyboard handling. The routines form a central core around which the high-level language interpreter operates, as shown in figure 1.

Since the MOS routines are powerful tools for the assembly language programmer as well as the machine's own interpreter, Acorn was careful that they were made as accessible as possible. There are several entry points to the MOS. Since the MOS is so big — around 16K — and contains so many routines, it was necessary to provide a modified method of calling these routines, rather than the straightforward listing of a suitable calling address for each routine.

The MOS is divided into 13 sections, each performing a particular task or collection of tasks, each of which has an address to which an assembly language, JSR or Basic Call,USR can refer.

Where there are several tasks to a section, it is necessary to specify which one is being called by placing an identification number in the accumulator just before executing the call. Figure 2 is a comprehensive summary of the OS features.

The sections that comprise the MOS are shown in the left-hand column of figure 2. We will take them one by one.

Oswrch — OS WRite CHaracter in accumulator: also known as the "VDU driver", this section is responsible for the input-output to the VDU — which includes the 32 ASCII control characters as well as the printable character set.

The Basic statement VDU a,b,c,. . . is equivalent to:

```
A%=a : CALL OSWRCH : A%=b : CALL
  OSWRCH
```

or

```
LDA# a : JSR OSWRCH : LDA# a : JSR
  OSWRCH
```

in Basic and assembler respectively.

This is obviously a very powerful routine because it means that all Basic screen commands can be written as a series of VDU commands and therefore all can be easily performed at assembly-language level.

Suppose, for example, we wished to do the following sequence of operations in assembly language:

1. Select mode 2 — mode 2 in Basic is equivalent to VDU 22,2
2. Set graphics foreground colour red — GCOL 0,1 which is equivalent to VDU 18,0,1.
3. Draw a line between (100,100) and (300,200).

The latter is done by

```
MOVE 100,100 : DRAW 300,200
```

or

```
VDU 25,4,100;100;25,5,300;200;
```

which is again the same as

```
VDU 25,4,100,0,100,0,25,5,44,1,200,0
```

The operations can be written as one long VDU statement:

```
VDU22,2,18,0,1,25,4,200,0,100,0,25,5,44,1,200,0
```

Which is easily written in assembly language:

```
LDA# 22 : JSR OSWRCH : LDA # 18 : JSR
OSWRCH : LDA# 0. . . etc
```

Or, to make it more tidy and less bulky:

```
FOR x%=1 TO 17
READ a%
[: LDA# a% : JSR OSWRCH :]
NEXT x%
DATA 22,2,18,0,1,25,4,200,0,100,0,25,5,44,
1,200,0
```

Outputting prompts or messages from a machine-code program can be a tedious business on a bit-mapped machine like the BBC, but again the Oswrch routine helps make light work of this. The following procedure can be used in an assembly-language program to generate the code to output a message, which is passed to the procedure as a string parameter:

```
DEF PROCMESSAGE(x$)
  LOCAL i%
  FOR i%=1 TO LEN (x$)
    [: LDA# ASC(MID$(x$,i%,1)) : JSR
     OSWRCH :]
  NEXT i%
ENDPROC
```

Of course, before you can call Procmessage you must leave the assembler and then re-enter it after the call. The procedure generates five bytes of code for every character in the message, so ensure you have reserved enough memory.

Oswrch, and all the other Osnames, is not a defined constant. You should set it at the beginning of a program and use it to aid readability. The actual value it has varies from one MOS issue to the next but you can set it so that it does not matter which MOS you have. This is done by:

```
OSWRCH=!&20E AND &FFFF
```

The reason for this obscure-looking command will become clear later.

Osbyte — OS routines that use the processor's registers to pass byte-size parameters. We have seen how the entire

) THE
ATING
M

range of VDU commands can be performed by a call to Oswrch but these do not constitute the entire range of screen-handling facilities provided by Basic, such as altering the flash-rates of colours and seeing what character lies at the position of the text cursor. These are all performed in Basic by the *FX command, which also controls many other machine functions not connected with the screen — see page 418 of the manual. The Osbyte routines provide the entire range of *FX commands in the same way as Oswrch did the VDUs, though this time there are many differing routines and we choose which one we want by placing an identification number in the accumulator prior to the call. In common with the VDU statement, the *FX statement may have more than one parameter, for example:

*FX 12,50

sets the keyboard auto-repeat to half a second. However, there are never more than three parameters so the entire statement can be performed in one go by passing the parameters in the A,X and Y registers of the 6502A. This avoids the need for repeated calling, necessary in the Oswrch section. For the call

*FX a,b,c

a is the call number and is passed in the accumulator; b is the first parameter, present on the most calls, and is passed in the processor's X register; c is the second parameter, only present on a few calls, and is passed in the Y register. So the

*FX 12,50

call would be done as follows:

LDA# 12 : LDX# 50 : JSR OSBYTE

Osbyte having been previously defined. In some cases success/failure indicators or results are returned in the register. You should consult the manual to see further. The value of Osbyte is set by

Osbyte = ! &20A AND &FFFF

Osword — OS routines whose parameters are taken from specified words or memory. So far we can perform a large range of useful functions using Oswrch, where each call provides one parameter in the accumulator, and Osbyte, where each call gives up to three parameters in the processor's only three registers. There are a few more important features we would need regularly that need a lot more specified parameters than either Oswrch or Osbyte. For example it is vital that the OS provides sound-generating routines otherwise we would be left to manipulate the sound chip's registers ourselves if we required sound to be produced from a machine-code program. However the Basic's Sound and Envelope statements need a lot of parameters — far too many to be passed in the A,X,Y registers of the processor. The technique used to make these Osword calls is to use the A register as before — that is, to identify the function required — see figure 2 — and to pass the Address of a block of locations in RAM where we have previously stored the parameters in a predefined order in the X register — low byte — and Y register — high byte. A good example of this process is sound generation.

Oswrch, Osbyte and Osword are by far the most useful MOS sections to the assembly language programmer but for completeness I will briefly describe the other MOS parts.

Osrdch — this MOS section deals with inputting characters from the keyboard. This is not really as useful as it sounds since most purposes will require that typing ahead has no effect and so an Osbyte call of 129 would be a better method. Contrast this to the two forms of Inkey statements — a negative argument tests whether a key is held at that instant.

OSRDCH = !&210 AND &FFFF

Figure 1. The user relates to the operating system via the Basic interpreter. The high-level language relates to the operating system via machine code, but using pre-written OS routines.



is the prefered definition of the address.

Osfind, Osgbpb, Osbput, Osbget, Osargs, Osfile — these are all calls to deal with the setting up of a data file on the current filing system, and then performing transfers to and from it.

Osnewl — this simply causes a new line to be started on the screen

OSNEWL = &FFE7

Osasci — equivalent to Oswrch except that a line feed is issued if, on calling, the accumulator contains &0D.

OSASCI = &FFE3

Oscli — This provides another way of calling MOS routines. If, on calling Oscli, the 6502A's X and Y registers point to the start of a command line in memory. Suppose we had

TV 0,255

stored in succesive bytes from location &2345 then we would put &45 into X and &23 into Y. Then the command line interpreter will interpret and execute the command.

OSCLI = ! &208 AND &FFFF

That concludes the machine-operating system sections. At this point it would be wise to point out that there is a price to be paid for all the power and flexibility of the routines provided by the MOS and it is speed. A little time must be taken for the MOS to examine your call and cause execution of the correct routine inside of the section you have called to. However, this may not be such a disadvantage since the chances are that, should you have written your own routine to do the job, it would not be as efficiently coded as those inside the MOS and would thus be slower anyway.

Up until now we have assumed that when we execute a call such as JSR Oswrch — with Oswrch defined as &FFEE — the program flow goes directly to &FFEE and the routine starts there. This raises an immediate problem; when a second processor is fitted the whole memory-map of the machine changes and it can no longer be guaranteed that the routine actually begins at &FFEE in the second processor.

Similarly, if you were to update your OS to the latest version, it would be highly unlikely that that particular routine was still held at the same starting address. In both cases, any calls such as the above would fail and therefore the program would fail also, unless it was modified suitably. These problems are neatly avoided by introducing indirection into the call mechanism. In simple terms, the real sequence of events when we call a MOS routine is: first, we make our call, as before, to an address in the range &FF00 to &FFFF. Second, the operating system then looks at two consecutive bytes in RAM and from them obtains a 16-bit address previously put there by the bootstrap on power-up or Break. This address may change from machine to machine depending on the MOSs and whether or not second processors are fitted, but it always points to the start in memory of the code that performs the routine we originally wanted. This 16-bit RAM-held address is called the Vector for that particular call. Third, the routine can now be performed by jumping to the address given by the vector.

Although all of the vectors are originally set at power-up, since they are held in RAM there

(continued on next page)

(continued from previous page)

is nothing to stop us changing them so that they point to our own routines in RAM. We could then write routines which completely replace those in the MOS.

I will now demonstrate writing a routine which performs a small operation before branching to the address that was the original vector. This program will cause the BBC to beep every time a key is pressed on the keyboard. First of all we have to be able to produce a Beep in machine code, which is achieved using a call to the Osword routine for sound generation. The stages for this are first, set up a parameter block — this can be done in Basic at the start:

```
10 DIM PARAM% 7 : OSWORD=! (&20C)
   AND &FFFF
20 FOR i%=1 TO 8
30 READ p% : ? (PARAM% +i%-1)=P%
40 NEXT
50 DATA &11,0,&F6,&FF,&14,0,2,0
```

See page 461 of the manual to see how a sound parameter block should be arranged. The Data statement gives rise to the parameters equivalent to those in the Sound statement:

```
SOUND &11,-10,20,2
```

Assemble the code to call up the sound routine in Osword:

```
 70 DIM P% 30
 80 [
 90 .beep PHA:TXA:PHA:TYA:PHA
100 LDA# 7
110 LDX# PARAM% MOD 256
120 LDY# PARAM% DIV 256
130 JSR OSWORD
140 PLA:TAY:PLA:TAX:PLA
150 RTS
160 ]
```

Run this program and then do Call Beep and you should hear a short tone. Lines 90 and 140 Save and Restore the A,X,Y registers, since this will be necessary in the full program.

We must now decide how to arrange things so that the subroutine Beep gets called every time a key is pressed. When a key is pressed, three things happen, one, an interrupt tells the processor that this has occurred; two, the MOS uses its Osrdch routine to take this character from the keyboard; three, the character is possibly echoed to the screen and further action may be taken.

Since two and three involve Operating System calls, we could intercept them by changing the vector of which one we choose so that it points to Beep. It turns out that it is best to choose number two. Three further modifications are required to complete the program. Save the value of the Osrdch vector so that the proper Osrdch routine can still be called at the end of the beep routine.

```
60 v%=! (&210) AND &FFFF
```

Now call the real Osrdch routine after our Beep routine so that the proper things still happen when we press a character.

```
145 JSR v%
```

The Basic program should change the Osrdch vector to point to Beep, but only after its old value has been saved.

```
170 ?(&210)=BEEP MOD 256 :?(&211)=BEEP
DIV 256
```

The program can now be run and deleted; the key-beep will remain. Although not very practical in itself, this is a good illustration of the way in which it is possible to use a little ingenuity to attain a desired effect. ■

MOS section	Address	Vector	Function	Routines inside
OSGBPB	&FFD1	21A	Load/Save Memory	
OSFIND	&FFCE	&21C	Opening files	Open for read (&40), Open for Write (&80) Close (0), Open for Read and Write (&c0)
OSBGET	&FFD7	&216	Reads Byte	—
OSBPUT	&FFD4	&218	Writes Bytes	—
OSARGS	&FFDA	&214	Attributes —	
OSFILE	&FFDD	&212	R/W Files	Contents of accumulator decide what to Read/Write
OSRDCH	&FFE0	&210	Reads from Input Stream (IS)	
OSWRCH	&FFEE	&20E	Writes to IS	Causes output of character or control code whose ASCII code is in accumulator
OSASCI	&FFE3	none	Writes to IS	As above, but new line if accumulator=&0D
OSNEWL	&FFEE	none	Writes to IS	Outputs line feed, carriage return only
OSWORD	&FFF1	&20C	Miscellaneous	Reads line from input stream to RAM (0)
				Reads internal clock (1)
				Writes internal clock (2)
				Reads interval timer (3)
				Writes interval timer (4)
				Reads a byte across the Tube (5)
				Writes a byte to processors memory across Tube (6)
				Performs sound (7)
				Envelope definition (8)
				Reads a pixel colour at specified position (9)
				Reads dot pattern on non-control character (A)
				Returns palette/logical colour relationship (B)
OSBYTE	&FFF4	&20A	Effects	The following are in numerical order of accumulator contents.
				Prints MOS report
				—
				Choose input stream
				Choose output stream
				Enable or disable cursor edit keys (4)
				Parallel or serial printer select
				Define printer, ignore character
				Set serial port receive rate (7)
				Set serial port transmit rate
				Select flash speed of foreground colour (9)
				................Background..............
				Miscellaneous enables
				................disables
				Empty buffers
				Select ADC channel number (16)
				Starts analogue-to-digital conversion
				Clear soft keys
				Pause until fields are synchronised
				Explode user-definable key memory
				Empty chosen buffer
				Cancel escape condition (124)
				Set escape condition
				Acknowledge presence of escape condition (126)
				Select base number for soft-key codes
				..................shift......................
				..................control...................
				..............shift/control...............
				Perform escape
				enable/disable escape key
				.........interrupt request for user 6522
				..............................ACIA 6850
OSCLI	&FFF7	&208	Interpreting command line	

Figure 2: Summary of facilities offered by operating systems 1.0 and above. The call numbers for the routines inside are shown in brackets.

SIR Computers Ltd
CARDIFF

Agents for Acorn, BBC and TORCH Computers

BBC Microcomputers

Model 1 A with 32K RAM and VIA	£339.00
Model 1 A with 32K RAM, VIA and Joystick port	£354.00
Model B	£399.00
Model B with disc interface	£509.00
Single 100K disc drive	£249.00
Dual 2 × 100K disc drive	£389.00
The disc manual and utilities disc are both included.	
Disc interface for the BBC Micro (kit)	£95.00
(fitted)	£110.00
Upgrade of BBC Model A to B	£90.00

Please telephone for up to date information on Prestel, Teletext, speech synthesis, second processors, etc.

TORCH Computers

Z-80 Disc Pack for the BBC Microcomputer	£895.00

This unit connects to the BBC Micro in the same way as a normal disc drive, but as well as offering a dual 2 × 400K disc drive for use under BBC BASIC or other languages it provides the option of using the wide range of CP/M software available for business and data processing applications. The firmware supplied with the machine allows switching between BASIC and CPN, a powerful operating system developed from CP/M 2.2.

In addition to the disc pack a second processor is supplied. This is a Z-80A with its own 46K RAM card, communicating with the 6502A in the BBC computer through the 'Tube'. Typically the speed of execution of programs under the twin-processor system is increased by up to 50% compared with a conventional single-processor computer.

A third processor, the 16 bit 68000, will shortly be available.

TORCH CF240	£2,795.00 (Ex. VAT)

This an extension of the BBC microcomputer/Torch disc pack system, available in a single unit. The computer contains a BBC based peripheral processor connected to the main Z-80 computer, a dual 2 × 400K disc drive as described above, a high resolution (80 character) colour monitor and a complete British Telecom approved 1200 baud modem. It is the only microcomputer which has been granted permission for direct connection to the Public Switched Telephone Network both in the U.K. and the United States.

The TORCH can communicate either directly with another TORCH or with virtually any other type of computer via Prestel. Using the Gateway facility of Prestel it is possible for the TORCH to access vast amounts of information stored by private organisations on public database systems. The Mailbox facility of Prestell also allows the use of electronic mail.

TORCH CH240/10 As above but with a 10 MB hard disc drive.
TORCH CH240/21 As above but with a 21 MB hard disc drive.

Peripherals

Seikosha GP 100A printer	£229.00
Epson MX 80 F/T type 3 printer	£389.00
NEC PC 8023 printer	£389.00
Microvitec 14" RGB Monitor	£299.00
Kaga 12" RGB Monitor	£280.00
Sanyo 14" RGB Monitor	£260.00
High resolution 12" black/green monitor	£85.00

Software

We currently hold in stock programs from the following suppliers:

Acornsoft	Level 9 Software
A & F Software	Molimerx
Bug Byte	MP Software
Computer Concepts	Program Power
Digital Fantasia	Salamander Software
Golem	Software for All
IJK Software	Superior Software

Unfortunately we are unable to supply software by mail except as part of a larger order.

Delivery by Interlink of any of the above items	£10.00

Unless otherwise stated all prices include VAT.

SIR Computers Ltd.
91 Whitchurch Road, Cardiff
Telephone (0222) 21341

AMBA SOFTWARE

FAST ACTION GAMES FOR THE SPECTRUM AND ZX81 ALL IN MACHINE CODE

SUB TRACK (SPECTRUM) Use your wits to destroy the enemy submarines with depthcharges, but watch out for their mines and their secret weapon. Your ship could be blown out of the water. 24 game variations.

TREASURE HUNT (SPECTRUM) Explore one of the 29 mazes in search of treasure and grab as much as you can. This game can be played with or without moving obstacles; with one player, two players in opposition, or two players in partnership; and with part or all of the maze invisible. There are 144 variations of this fascinating game and even the game selector is fun to use.

HUNT (16K ZX81) A ZX81 version of Treasure Hunt with 48 variations.

X-MEN (16K ZX81) The only Puckman type game with all of these features: true gobbling action, bonuses, arcade type maze, 3 lives, graphic display of lives left, 4 monsters, a den, booster buns, high score, continuous on-screen scoring.

SNACKMAN (SPECTRUM) All the features of X-MEN plus 16 mazes, 10 speeds, and of course, high resolution colour graphics and great sound effects.

UFO (16K ZX81) A fast moving space game, not recommended unless your reations are lightning fast.

TRAP (16K ZX81) You control a growing wall and try to surround your opponent (computer or human) before he surrounds you. 12 variations.

£4.95 PER GAME ON CASSETTE

Available from:-
BUFFER MICRO, LONDON
PHILLIP COPLEY, OSSETT
GAMER, BRIGHTON
GEORGES, BRISTOL
MICROWARE, LEICESTER
SCREENSCENE, CHELTENHAM

By Mail Order
Cheque/P.O. To:
AMBA SOFTWARE
FREEPOST
(no stamp required)
CAMBRIDGE
CB3 7BR

SINCLAIR AND ORIC COMPUTERS



UK prices are shown first. The bracketed prices are export prices which include insured air-mail postage to all the countries of Europe including Norway, Sweden, Finland and Denmark. For overseas customers outside Europe an extra £5 postage per item is charged.
Oric 1 48K computer £147 (£158).
zz81 £43.43 (£52). zx printer £52.13 (£61). zx spectrum £108.70 (£129). zx spectrum 48K £152 (£172). 32K memory upgrade for 16K spectrum (Issue 2 only) £44 (£45). zx microdrive n/a (n/a). zx rs232 n/a (n/a). 5 printer rolls £10.43 (£16). zx81 ram packs:— 16K £26.04 (£28), 32K £39 (£41). 56K £49 (£51).

DRAGON 32 £173

COMMODORE COMPUTERS

Commodore 64 £299. Vic 20 £130. Kit to allow the use of an ordinary mono cassette recorder with the Vic 20 and the Commodore 64 £6. Commodore cassette recorder for these computers £36.50. Super expander high resolution cartridge £27.95. We stock most accessories.

BBC MICROCOMPUTERS

A Model £260. B Model £347.

GENIE COMPUTERS

New colour Genie £179, cassette recorder £25, 16K ram card £33. Light pen £15. Accessories for Genie 1 and Genie 2:— EG3014 32K £189. Disc drives single £199, dual £369. Double density convertor £72. High resolution graphics £82. Printer interface £36.

UK101 AND SUPERBOARD

32 × 48 display expansion kits UK101 £9, Series 1 Superboard £14. 32K memory expansion board £60. Cegmon £22.50. Word processor prog £10. Centronics interface kit £10. Cased disc drives with DOS single £275, double £415. Stand alone floppy disc controller £85.

ORIC·1 48K COMPUTER £147.78

PRINTERS



Low cost daisy wheels:— Smith-Corona TP1 £418, Brother HR1 £520. Olivetti Praxis 30 Bytewriter:— the latest miracle, a combined daisy wheel printer and electric typewriter for only £418. Epson MX80FT3 £324. Epson MX100/3 £425. Oki Microline 80 £199. Oki Microline 82A £343. Oki Microline 83A £467. Oki Microline 84 £684. Oki Microline 92 £437. Oki Microline 93 £599.

5V POWER KITS

Fully stabilized 5V computer and TTL power kits. 1.5A £7.83, 3A £12.17, 6A £20.87.

SHARP COMPUTERS

We can supply Epson MX80 and MX100 printers to run direct from the MZ80K (i/o box not needed) for £48 plus printer price. We also specialize in interfacing printers to the MZ80K, MZ80A and MZ80B both with and without the i/o box.

SWANLEY ELECTRONICS

Dept YC, 32 Goldsel Rd., Swanley, Kent BR8 8EZ.
Tel Swanley (0322) 64851

Postage £1 on Sinclair products (UK), £3.50 on other computers, £4.50 on printers and 50p on other orders. Please add VAT to all prices. Official credit and overseas orders welcome.

```
10 REM ##################
20 REM ##              ##
30 REM ##  S.O. 6/82   ##
40 REM ##################
49 REM VBI AND DLI ROUTINES
50 FOR I=1536 TO 1613:READ A:POKE I,A:NEXT I:POKE 206,4:POKE 207,4:A=USR(1536)
60 DATA 104,160,10,162,6,169,7,76,92,228,173,199,2,205,200,2,240,16,198,207,208,25,169,5,133,206
70 DATA 173,200,2,141,199,2,208,13,198,206,208,9,169,10,133,207,165,208,141,199,2,169,0,133,209,
76,98,228
80 DATA 72,138,72,166,209,189,75,6,141,10,212,141,26,208,232,134,209,104,170,104,64,155,152,24
89 REM CHANGE CHARACTER SET
90 GOSUB 3000
99 REM STRINGS HOLDING PRINT POS.
100 DIM C$(7),X$(7),Y$(7),X5$(7),Y5$(7),X7$(7),Y7$(7),X6$(7),Y6$(7),X14$(7),Y14$(7),X10$(7),Y10$
(7)
105 DIM X11$(7),Y11$(7),X9$(7),Y9$(7),BX(7),BY(7)
110 FOR I=1 TO 7:X5$(I)=CHR$(8+I):Y5$(I)=CHR$(8+I):X7$(I)=CHR$(8+I):Y7$(I)=CHR$(9):X6$(I)=CHR$(8
+I)
115 Y6$(I)=CHR$(10-I):X14$(I)=CHR$(9):Y14$(I)=CHR$(10-I):X10$(I)=CHR$(10-I):Y10$(I)=CHR$(10-I)
120 X11$(I)=CHR$(10-I):Y11$(I)=CHR$(9):X9$(I)=CHR$(10-I):Y9$(I)=CHR$(8+I)
129 REM CHOOSE INPUT DEVICE
130 GRAPHICS 18:POKE 756,START/256:NEXT I:POSITION 6,3:? #6;"choose":POSITION 4,5:? #6;"1 paddle
"
131 REM 'paddle' & 'joystick' IN INVERSE CHAR.
135 POSITION 8,6:? #6;"or":POSITION 4,7:? #6;"2 joystick":OPEN #1,4,0,"K"
140 GET #1,A:IF A<49 OR A>50 THEN 140
150 POSITION 9,9:? #6;CHR$(A):INDEV=A-48
199 REM PROGRAM INITIALIZATION
200 DIM F(7),ST$(10),BP$(4):BP$="burp":MAXWAIT=6:MAXBUG=30
210 RESTORE 220:FOR I=1 TO 10:READ A:ST$(I)=CHR$(A):NEXT I
220 DATA 7,5,6,0,1,3,2,0,0,4
280 POKE 208,37:S=1:REM 208 IS BUG COLOR
285 REM INITIAL DIFFICULTY SELECTION
286 GRAPHICS 1:POKE 708,229:POKE 712,155:GOSUB 700:GOSUB 400
289 REM RESTART GAME
290 FOR I=1 TO 7:F(I)=0:NEXT I:SCORE=0:NUMBUG=0:BONUS=50
300 GRAPHICS 1:POKE 756,START/256:GOSUB 700:X$=X5$:Y$=Y5$:POKE 708,229:POKE 709,54:POKE 710,227:
POKE 712,155
305 REM DRAW
306 GOSUB 2000:POSITION 8,5:GOSUB 905
308 REM MAIN LOOP
309 IF INDEV=2 THEN GOSUB 500:GOTO 320
310 S=INT((PADDLE(0)-45)/20):IF S>7 THEN S=7
312 IF S<1 THEN S=1
314 S=8-S
320 POSITION 8,5:GOSUB 900+S
325 IF INDEV=2 AND STRIG(0)=0 THEN GOSUB 1000
330 IF INDEV=1 AND PTRIG(0)=0 THEN GOSUB 1000
339 I=0:IF WAIT>1 THEN WAIT=WAIT-1:GOTO 350
340 WAIT=MAXWAIT
341 I=I+1:IF I=8 THEN 350
342 IF F(I)=0 THEN 341
345 IF F(I)=2 THEN 347
346 RESTORE 800+I:READ DX,DY,BX,BY:POSITION BX,BY:? #6;CHR$(129):F(I)=2:BX(I)=BX:BY(I)=BY:GOTO 3
41
347 RESTORE 800+I:READ DX,DY:POSITION BX(I),BY(I):? #6;" ":BX(I)=BX(I)+DX:BY(I)=BY(I)+DY
348 POSITION BX(I),BY(I):? #6;CHR$(129):IF BX(I)>5 AND BX(I)<13 AND BY(I)>5 AND BY(I)<11 THEN 37
0
349 GOTO 341
350 IF BUG>1 THEN BUG=BUG-1:GOTO 360
352 BUG=MAXBUG:IF NUMBUG=7 THEN 360
354 I=INT(RND(0)*7)+1:IF F(I)>0 THEN 354
356 F(I)=1:NUMBUG=NUMBUG+1
360 GOTO 309
369 REM BUG GOT TO FROG
370 POSITION 8,5:? #6;". .":FOR I=1 TO 6:POKE 708,38:SOUND 0,100,12,10:FOR J=1 TO 50:NEXT J
375 POKE 708,36:SOUND 0,150,12,10:FOR J=1 TO 10:NEXT J:NEXT I:SOUND 0,0,0,0
398 GOSUB 400:GOTO 290
399 REM PROMPT FOR NEW GAME
400 POSITION 4,13:? #6;"PRESS start":POSITION 6,14:? #6;"TO PLAY":REM USE IN INVERSE CHAR. IN TH
ESE TWO LINES
401 POSITION 4,16:? #6;"PRESS select":POSITION 3,17:? #6;"FOR DIFFICULTY"
402 POKE 53279,8:K=PEEK(53279):IF K=6 THEN 420
404 IF K=5 THEN MAXWAIT=MAXWAIT-1:MAXBUG=MAXBUG-5:IF MAXBUG<5 THEN MAXBUG=30:MAXWAIT=6
406 POKE 656,0:POKE 657,3:? 7-MAXWAIT
408 FOR I=1 TO 100:NEXT I
410 GOTO 402
420 POSITION 5,16:? #6;"           ":POSITION 3,17:? #6;"              "
430 IF SCORE>MAXSCORE THEN MAXSCORE=SCORE
440 RETURN
499 REM JOYSTICK SUBROUTINE
500 SO=STICK(0):IF SO=15 OR SO=13 THEN RETURN
510 S=ASC(ST$(SO-4)):RETURN
599 REM BURP SUBROUTINE
600 POKE 77,0:X=1:Y=0:FOR K=1 TO 4:X=X+1:Y=Y+1:POSITION X,Y:? #6;BP$(K,K):NEXT K
620 FOR K=250 TO 150 STEP -3:SOUND 0,K,2,10:NEXT K
630 X=1:Y=0:FOR K=1 TO 4:X=X+1:Y=Y+1:POSITION X,Y:? #6;" ":NEXT K:RETURN
699 REM CHANGE DISPLAY LIST
700 A=PEEK(560)+256*PEEK(561):POKE A+3,198:POKE A+15,134:POKE A+24,134
710 IF PEEK(A)<>66 THEN A=A+1:GOTO 710
720 POKE A,71:POKE A+3,7:POKE A+4,65:POKE A+5,PEEK(A+7):POKE A+6,PEEK(A+8)
722 POKE 512,54:POKE 513,6:POKE 54286,192
730 POKE 656,0:POKE 657,3:? 7-MAXWAIT:POKE 656,0:POKE 657,15:? MAXSCORE
740 POSITION 2,19:? #6;"dif  score  high":RETURN
800 REM X-Y INCREMENTS & STARTING POS.
801 DATA 1,-1,0,18
802 DATA 1,0,0,9
803 DATA 1,1,0,0
804 DATA 0,1,9,0
805 DATA -1,1,18,0
806 DATA -1,0,18,9
807 DATA -1,-1,18,18
900 REM PRINT EYES ON FROG
901 X$=X9$:Y$=Y9$:? #6;") )":RETURN
```


CRA OLD TOA

Gulp down those bugs as you drift lazily on your lilypad with Stan Ockers' game for the Atari.

YOU PLAY the part of an extremely hungry toad. Your object is to eat all bugs before they reach you by pointing the toad's beady eyes at the incoming bug. You will find that your tongue snakes out and slurps up the bugs when you press the Fire button. Points are scored depending on the difficulty level. However, if the bug hits you, you die. The level of difficulty can be set at the start of the game. Either a joystick or paddle controller can be used.

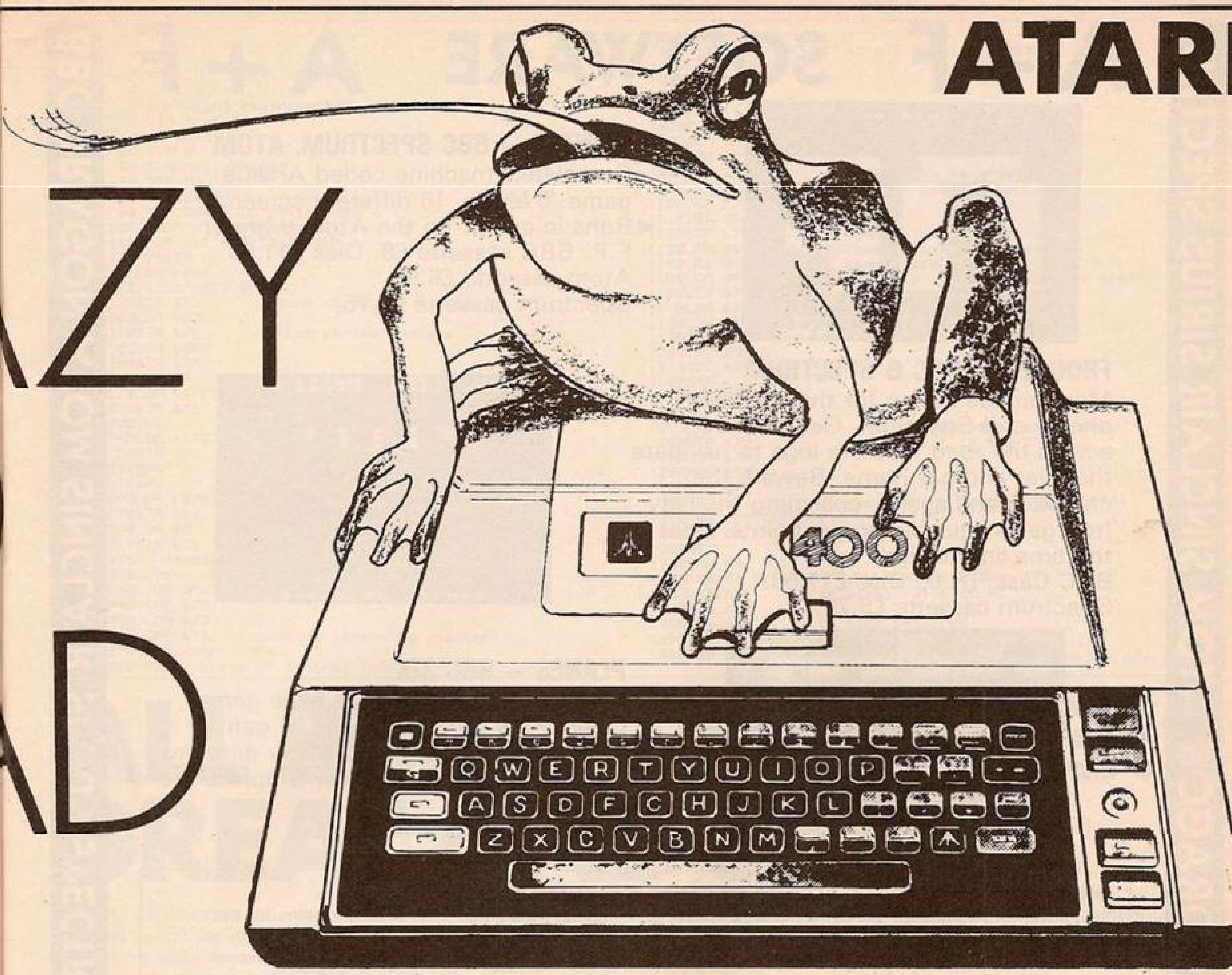
The bugs are made to blink on and off by a Vertical Blank Interrupt — VBI — routine that changes the bugs' colour to background colour and back. The VBI routine also has an important function in connection with another routine, the Display List Interrupt routine.

The display list is modified, lines 700-720, to change the text area to two mode 2 lines and also to set display list interrupts at three points down the vertical height of the screen. When these interrupts occur the DLI routine changes the background colour depending on a counter which counts the DLIs. During the vertical blank period this counter is reset to zero, ready for the next screen. This technique gives separate colours to the sky, water and score areas.

The character set has been altered enabling the toad to be printed in graphics mode 1. This

ZY

D



gives a choice of upper case and punctuation or lower case and graphics symbols. It is best to pick the former and change the punctuation starting with that above the numerals on the keyboard, leave the quotation mark alone. The set must first be moved from ROM to RAM and I use a machine-code routine stored in ZZ$ to do this — line 3000.

To move the tongue around, keep track of the print positions. I put these locations in strings; a set of Xs and Ys for each direction — lines 100-120. The positions are recovered from the strings by using the ASC function — lines 1002 and 1004.

Atari Basic can restore data values to the beginning of a certain line. This function is used in picking up the starting position and increments of the bugs — 346 to start or line 347 to continue — flags — F(I) — keep track of the condition of the bugs; 0 means the bug is active, 1 it is in motion and 2 means that it collided with something.

Wait and Bug are counters that skip over the start-a-bug and move-bug sections. When the counters reach zero, a new bug is started or all the bugs are moved and the counters are set to Max Wait, Max Bug respectively. The larger these maximums, the slower things go and the difficulty level is increased by reducing Max Wait and Max Bug. ■

```
902 X$=X11$:Y$=Y11$:? #6;"( (":RETURN
903 X$=X10$:Y$=Y10$:? #6;"# #":RETURN
904 X$=X14$:Y$=Y14$:? #6;"$ $":RETURN
905 X$=X6$:Y$=Y6$:? #6;"% %":RETURN
906 X$=X7$:Y$=Y7$:? #6;"& &":RETURN
907 X$=X5$:Y$=Y5$:? #6;"' '":RETURN
999 REM TONGUE ROUTINE
1000 I=0
1001 I=I+1:IF I=8 THEN 1010
1002 POSITION ASC(X$(I)),ASC(Y$(I)):GET #6,A:C$(I,I)=CHR$(A)
1004 POSITION ASC(X$(I)),ASC(Y$(I)):? #6;CHR$(13):SOUND 0,7-I,8,8:IF A=129 THEN GOTO 1050
1005 GOTO 1001
1010 I=I-1:IF I=0 THEN 1020
1012 POSITION ASC(X$(I)),ASC(Y$(I)):? #6;C$(I,I):SOUND 0,7-I,8,8:GOTO 1010
1020 IF BURP=1 THEN GOSUB 600:BURP=0
1022 SOUND 0,0,0,0:RETURN
1049 REM GOT A BUG
1050 F(S)=0
1060 SCORE=SCORE+10*(7-MAXWAIT):POKE 656,0:POKE 657,8:? SCORE;"  ":NUMBUG=NUMBUG-1
1070 IF SCORE>BONUS THEN MAXWAIT=MAXWAIT-1:MAXBUG=MAXBUG-5:BONUS=BONUS+100*(7-MAXWAIT):BURP=1
1072 IF MAXBUG<5 THEN MAXBUG=5:MAXWAIT=1
1080 POKE 656,0:POKE 657,3:? 7-MAXWAIT
1090 C$(I,I)=" ":I=I+1:GOTO 1010
1999 REM PRINT FROG SUBROUTINE
2000 POSITION 6,6:? #6;"+*- -+*":POSITION 6,7:? #6;"+*---+*":POSITION 6,8:? #6;"+-----*"
2010 POSITION 6,9:? #6;"--* +--":POSITION 5,10:? #6;"+-+---*-*"
2020 POSITION 5,11:? #6;"---------":RETURN :REM INVERSE CHAR. IN THIS LINE
2999 REM CHANGE CHAR. SET SUBR.
3000 DIM ZZ$(32):RESTORE 3010:FOR I=1 TO 32:READ A:ZZ$(I)=CHR$(A):NEXT I
3010 DATA 104,104,133,204,104,133,203,104,133,206,104,133,205,162,4,160,0
3020 DATA 177,203,145,205,136,208,249,230,204,230,206,202,208,240,96
3030 POKE 106,PEEK(106)-5:GRAPHICS 0:START=(PEEK(106)+1)*256:POKE 756,START/256:POKE 752,1:? "IN
ITIALIZING ...."
3040 A=USR(ADR(ZZ$),57344,START):RESTORE 3100:FOR I=START+8 TO START+119:READ A:POKE I,A:NEXT I
3050 RETURN
3100 DATA 0,34,85,62,54,85,34,0,0,102,102,102,0,0,0,0,255,241,241,241,129,129,255,255
3110 DATA 255,189,189,189,129,129,255,255,255,143,143,143,129,129,255,255,255,129,143,143,143,12
9,255,255
3120 DATA 255,129,129,143,143,143,255,255,255,129,241,241,241,129,255,255,255,129,129,241,241,24
1,255,255
3130 DATA 240,240,240,240,240,240,240,240,15,15,15,15,15,15,15,15,0,0,0,0,0,24,24,48
3140 DATA 255,255,255,255,255,255,255,255,255,145,145,255,145,145,255,255
```

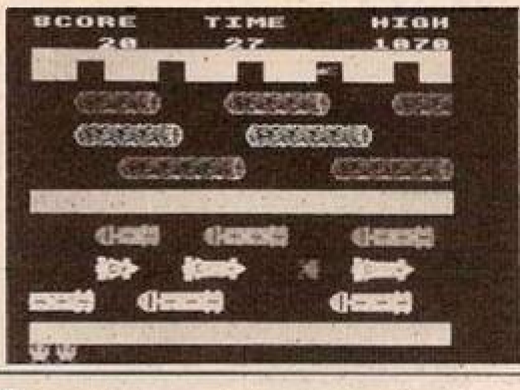
A+F SOFTWARE A+F



PAINTER – BBC SPECTRUM, ATOM
Completely machine coded Arcade game. 6 levels. 16 different screens. Runs in colour on the Atom without F.P. BBC cassette £8. Disk £11.50.
Atom cassette £6.90.
Spectrum cassette £5.75.

FROGGER – BBC & SPECTRUM
More arcade action for the BBC (as photo) and Spectrum. Get your frog across the road, use the logs to navigate the river and get home. Beware the crocodile and snake, collecting the lady frog gains valuable bonus points. Beat the time limit or die.
BBC Cass. £8.00 Disc £11.50.
Spectrum cassette £5.75.





PLANES – BBC 32K
Spectacularly fast arcade style game. Options for different speed of game- even the slowest is fast! Many different screens and bonus scores. Graphics are really superb.
Cassette £8.00 Disc £11.50.

ORIC
Two adventure games for the ORIC available NOW, Death Satellite and Zodiac. Both will run on the 16K machine. Cassettes at £6.90 per game.

DRAGON
Deadwood monopolies a western town – 1-4 Players, set your own time limit. Cassette £6.90.
Buccaneers – a piratical game again for 1-4 players Cassette £6.90.

ATOM

Space Panic	£6.90
Zodiac	£6.90
Death Satellite	£6.90
Cylon Attack	£6.90

Atom Utilikits still available from stock at £18.50.

SPECTRUM
Crazy Balloons – an excellent game for the 16K machine at £5.75.
Specfile – Stock control/data management system for the 48K machine £10.00.

BBC
Pharoah's Tomb – an interactive graphic adventure game for the Model B.
Cassette £8.00 Disc £11.50.
Tower of Alos another graphic adventure game – this will run on the A or B machine.
Cassette £6.90 Disc £11.50.

PLEASE NOTE THAT ALL OUR PRICES INCLUDE VAT & POSTAGE

5% DISCOUNT ON ALL SOFTWARE WITH THIS COUPON
(Quote 830/ A for discount on telephone orders)

NAME ______________________ PLEASE SEND ME:
ADDRESS ______________________

Please note prices include post & packing
You may also telephone (24 hrs) with credit card order

830 HYDE ROAD MANCHESTER M18 7JD
061-223 6206 (24 hrs) Telex 667461 (AHn A&F)

SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM

Listing 1.

```
 5*KEY 10 "?&18=&10|MOLD|M"
 10 L%=&D00
 20 ohr%=&C00:oswerch=&FFEE
 30 DIM T% 600
 40 T%=&D21
 50 DIM D% 15
 60 D%=L%+1:d%=L%+9
 70 DIM M% 15
 80 M%=L%+17
 90 FOR O%=M% TO M%+12 STEP 4
100 READ K%:!O%=K%:NEXT
110 FOR opt = 0 TO 3 STEP 2
120 P%=T%
130[OPT opt
140.gchar STX &70
150STY &71         \ store X%,Y%
160LDA &601
170STA &7E         \ find string address
180LDA &602
190STA &7F
200LDY #0
210LDA (&7E),Y
220STA &72         \ store lsb string add
230INY
240LDA (&7E),Y
250STA &73         \ store msb string add
260INY
270INY
280LDA (&7E),Y
290STA &74          \ store string len
300LDA #0
310STA &75          \ zero counter
315 \ ******* main control routine *******
320 .nchr JSR rot
330 JSR OPUT
340 INC &75
350 LDA &75
360 CMP &74   \ compare length re counter
370 BCC nchr
380 RTS    \ end of control loop
1000 \***** START OF ROTATE ROUTINE *****
1010.rot LDA #0
1020STA &7D
1030LDY &75
1040LDA (&72),Y     \ get chr from string
1050CMP #127        \ system or user-defined ?
1060BCC R1
1070SBC #224
1080STA &77         \ ordinal No user-defined
1090LDA #&0C        \ base of user characters
1100JMP R2
1110.R1 SBC #31
1120STA &77         \ ordinal No user-defined
1130LDA #&C0        \ base of system characters
1140.R2 STA &7E     \ store base value
1150LDA #0          \ multiply ordinal number by eight
1160STA &7C
1170LDA &77
1180LDX #2
1190CLC
1200.R3 ROL A
1210ROL &7C
1220DEX
1230BPL R3
1240CLC
1250ADC &7D           \ add to base value and store
1260STA &7D           \ the result in &7D/E
1270LDA &7C
1280ADC &7E
1290STA &7E
1300LDY #7            \ move the character definition
1310.R4 LDA (&7D),Y   \ into D%
1320STA D%,Y
1330DEY
1340BPL R4
1350\***** START OF TURN ROUTINE *****
1360LDA &70       \ original value of X%
1370STA &7F
1380BEQ R8        \ no turn required
1390.R5 LDY #7  \ No of bytes in def
1400.R6 LDA D%,Y \ get a byte
```

(listing continued on next page)

ALL BBC CHARACTERS GREAT AND SMALL

Mix double-height, normal and double-width text on the screen at the same time. Fintan Culwin shows you how to do it.

GROUPS OF PEOPLE and the young are supposed to find the 20-column modes of the BBC Micro easier to read. Personally I have never found this true. The double-width characters are too far removed from any other form of printed character to be easily recognisable; double-width and double-height characters would be much more effective. The double-height characters of mode 7 can be used very effectively to title and highlight parts of the text without this disadvantage, however no other graphics mode allows different-sized characters to be mixed on the screen. Another shortcoming of the text capability of the high-resolution modes is the inability to produce text in any other orientation than the conventional left-right direction. It is useful, for example, to label graphs by plotting text from the bottom to the top of the screen, or with games to plot a user-defined character in more than one orientation.

Having grown used to having these facilities available on other machines, I produced the machine-code program shown in listing 1 to make possible a much more flexible use of text in BBC high-resolution graphics modes. Specifically it will plot a string on to the screen in any one of four orientations in any one of four character sizes.

The four possible sizes are normal, double-width, double-height, and double-width and height. These sizes are related to the normal character sizes for the graphics mode you are currently using. The double-width and double-height options refer to the screen and not to the character — take a deep breath and think about it.

The size is selected by the value of Y% when the routine is called. The values are 0 for normal, 1 for double-width, 2 for double-height and 3 for double-width/height. These are controlled in a similar manner by the value of X%. The routine itself does not perform any error-checking on the values of X% and Y%. Values of Y% in excess of three will cause a default of double-width/height, but values of X% higher than three will cause disastrous results.

The string to be plotted is passed to the routine via the Call command. The first argument to the Call command is the entry point to the routine. In this case, the absolute value is &0D21 labelled by the variable GChar. The second argument to the Call is the variable name of the string, and not the string itself. The characters within the string can include any printable character. A random noise pattern will result if any control codes are passed in the string.

It is possible to perform error checking on the string and on the control variables from within the routine, but in the interests of keeping the code as short as possible I have omitted them from the version presented here. Instead, I have included listing 2 which is a procedure to check for these errors and halt

(continued on next page)

Listing 2.

```
 232 DEF PROCGCHAR(X%,Y%,string$)
1005 LOCAL L%,T%
1010 IF X%<0 OR X%>3 THEN PROCERROR
1020 IF Y%<0 OR Y%>3 THEN PROCERROR
1030 FOR L%=1 TO LEN(string$)
1040 T%=ASC(MID$(string$,L%,1))
1050 IF T%<32 OR T%>126 AND T%<125
     THEN PROCERROR
1060 NEXT L%
1070 CALL &0D21,string$
1080 ENDPROC
1100 DEFPROCERROR
1110 PRINT"Incorrect use of gchar
     function"
1120 PRINT' "Called with "'',"X%",
     X%',"Y%",Y%',"  ",string$
1130 END
```

Listing 3.

```
 135 .gchar LDA #0
 136 STA &76
 137 ROL &76    \ STORE C%
 140 STX &70
>
1510 .R8 LDA &76   \ normal or inverse?
1520 BEQ R12      \normal !
1530 LDY #7        \ start of invert
1540 .R11 LDA D%,Y
1550 EOR #&FF     \ invert here
1560 STA D%,Y
1570 DEY
1580 BPL R11      \ end of invert
1590 .R12 RTS     \** END OF ROT**
```

(continued from previous page)

program execution if such an error occurs. It uses X% and Y% as formal parameters to the procedure so it is safe to use these within the main body of the program without any confusion.

The routine was written on a machine fitted with operating system 0.1 EPROM. One of the jobs the routine has to do is to calculate the position in memory where the character definitions have been stored. The new user guide describes an Osword call implemented from version 1.0 onwards which will do this. If you have OS 1.0 fitted, the code given in listing 3 will ensure that the whole program runs smoothly.

Routine protection

The routine occupies less than 200 bytes hex and can thus fit into less than two pages of memory. Page &0D is reserved for user-supplied resident routines. If this and the following page are used, then the routine will only occupy one page of what is usually user memory. The routine has to be protected against the Resetting of Page by the operating system when the break key is pressed. This is done by the Key 10 definition in line 5. Before a final version of the routine is loaded or run this page must be reserved for it by resetting Page to &1000.

Once a working copy of the routine is successfully installed in the memory at this position a direct copy of the code can be made by Saving this section of memory. To do this use the *Save command.

For example

```
*SAVE "gchar" 0D00 0FFF
```

The code can be directly loaded back into memory using the *Load command

```
*LOAD "gchar"
```

Both of these operations are best done with full CFS information displayed. To do this use the command

```
*OPT 1,2
```

Remember to reset Page before attempting any Basic and to protect the Reset as described.

A note to model A owners or even extravagant users of model Bs. Up to two extra pages of memory can be obtained by resetting Page downwards. Program memory usually starts at &0E00. The page below this is reserved for user-supplied routines. If these are not being supplied then Page can be reset to &0D00 to allow Basic to use it. Page &0C is where the user-defined character information is stored. If user-defined characters are not being used within the program then this also can be used for program memory. The reset has to be protected against the Break key as described.

Most of the routine is explained in outline by the comment entries in the listing. It should be possible, if you are familiar with 6502 machine code, to reduce or enlarge the number of options fairly easily. The only non-standard part of the code is the method of storing the cursor movement information. The information for moving the cursor is stored in the 16-byte data block labelled by M%.

Each byte of data holds the information for horizontal and vertical movement of the cursor. The byte is split into two nybbles — four bits — each nybble holds a three-bit number and the sign. The first — left-most — nybble holds the up-down information in the order high bit, middle bit, low bit and sign.

Where sign is 0 for upward movement and 1 for downward movement. The second nybble holds information for left/right movement in a similar way but the order of the bits is reversed. Sign 0 indicates rightward movement and sign 1 leftward. This allows the maximum movement between characters of seven-character cells in any direction. The information is extracted from the data block decoded and implemented in the cursor subroutine.

If you are not conversant with BBC assembler the program can be copied directly into your machine.

Type and test

To facilitate typing and testing the program the actual location of the code can initially be left to the machine operating system. This will allow the routine to be entered and tested without bothering to reset Page, and possibly overwrite the program if any problems arise. To do this omit lines 5, 40, 60 and 80 until the routine has been fully tested. Then Load the program from &1000 upwards before re-entering the missing lines which locate it in pages &0D and &0E.

The final point to note is that the information is actually sent to the screen by continually redefining character 224 which is consequently unavailable for other uses within the user program. This restriction is accounted for within the ProcGchar procedure listing given.

(listing continued from previous page)

```
1410LDX #7        \ No of bits
1420.R7 ROL A     \ Push off a bit
1430ROR d%,X      \ catch within d%
1440DEX
1450BPL R7        \ any more bits ?
1460DEY
1470BPL R6
1480JSR dtoD      \ move turned character back to D%
1490DEC &7F
1500BNE R5        \ any more turns ?
1510.R8 RTS  \** END OF ROT **
2000 \***** START OF OUTPUT ROUTINE ****
2010.OPUT LDA &71      \ original value of Y%
2020CMP #0
2030BEQ normal          \ Y%=0
2040CMP #1
2050BEQ dwid            \ Y%=1
2060CMP #2
2070BEQ dhei            \ Y%=2
2080JMP dwihi           \ Y%>=3
2090RTS   \** END OF OPUT CONTROL **
2095 \***** START OF NORMAL *****
2100.normal JSR DtoO  \ normal size
2110LDA #224          \ move D% to O%
2120JSR oswerch       \ send to screen
2130JSR curs          \ move cursor
2140RTS  \ ** END OF NORMAL **
2300 \***** START OF DOUBLE WIDTH *****
2310.dwid JSR DtoO      \ moves charcter definition
2320JSR wsplit          \ to O% then splits into D%&d%
2330JSR DtoO
2340LDA #224
2350JSR oswerch         \ send first part to screen
2360JSR dtoD
2370JSR DtoO
2380LDA #224
2390JSR oswerch         \ send second part to printer
2400JSR curs                \ move cursor
2410RTS \** END OF DWID **
3000 \***** START OF DOUBLE HEIGHT ****
3010.dhei JSR hspli  \ hspli adresses screen directly
3020JSR curs            \ move cursor
3030RTS   \ ** END OF DOUBLE HEIGHT **
3100 \***** START OF DOUBLE WIDTH/HEIGHT *****
3110.dwihi JSR DtoO   \ transfer definition to ochr
3120JSR wsplit          \ split horizontaly
3130JSR hspli           \ send lhs to screen
3140LDA #10
3150JSR oswerch         \ move cursor
3160JSR dtoD                \ transfer rhs info
3170JSR hspli               \ send rhs to screen
3180JSR curs                \ move cursor
3190RTS  \ ** END OF DWIHI **
4000 \ ***** START OF HEIGHT SPLIT *****
4010.hspli  LDA #1          \ heightsplit
4020STA &7F                 \ set up counter
4030LDY #0
4040.h1 LDA D%,Y
4050PHA
4060INY
4070CPY #8                      \ push eight bits of definition
4080BMI h1                      \ onto processor stack
4090.h2 LDY #7
4100.h3 PLA                     \ take four bits off
4110STA ohr%,Y                  \ stack and put into ochr
4120DEY
4130STA ohr%,Y                  \ twice
4140DEY
4150BPL h3                      \ four bits done ?
4160LDA #224
4170JSR oswerch                 \ send to screen
4180LDA &7F
4190BEQ h4                      \ branch if all done
4200LDA #8
4210JSR oswerch
4220 LDA #11
4230JSR oswerch                 \ else move cursor
4240DEC &7F                    \ and decrease counter
4250JMP h2
4260.h4 RTS \** END OF HSPLIT **
4500 \***** START OF WORD SPLIT *****
4510.wsplit           \ splits character
4520LDX #1           \ in ochr into
4530STX &7F          \ D% and d%
4540.s1 LDY #3       \ no of bits to move
4550.s2 LDX #7       \ no of bytes to
4560.s3 LSR ohr%,X  \ push off a bit
4570BCC s4           \ jump if not set
4580ROR D%,X
4590SEC
4600ROR D%,X             \ put two set bits into D%
4610JMP s5
4620.s4 ROR D%,X
4630CLC
4640ROR D%,X             \ put two blanks into D%
4650.s5 DEX              \ any more bytes
4660BPL s3
4670DEY                  \ any more bits
4680BPL s2
4690LDA &7F
```

```
4700LSR A
4710BCC s6            \ branch if all done
4720JSR Dtod          \ else send this half to d%
4730DEC &7F           \ and decrease the counter
4740JMP s1            \ and do the othert half
4750.s6 RTS ** END OF WSPLIT **
5000 \***** START OF CURSOR CONTROL *****
5010.curs LDA #0
5020STA &7D
5030STA &7E
5040LDA &71      \ get original value of Y%
5050CLC
5060ROL A
5070CLC
5080ROL A        \ multiply it by eight
5090ADC &70      \ add result to original value of X%
5100TAY
5110LDA M%,Y     \ and use as an offset to the data table
5120STA &7F
5130LDX #4              \ store nyblle controling left/right
5140 .C1 ROR A
5150ROL &7D
5160DEX
5170BNE C1
5180LDA &7F
5190LDX #4              \ store nybble controling up/down
5200.C2 ROL A
5210ROL &7E
5220DEX
5230BNE C2
5240LSR &7D         \ decode left/right
5250BCS m1          \ chracter data
5260LDA #9          \ Prime for right
5270JMP m2
5280.m1 LDA #8       \ Prime for left
5290.m2 JSR cmv      \ move left/right
5300LDA &7E
5310LSR A
5320STA &7D             \ decode and transfer up/right
5330BCS m3
5340LDA #11             \ Prime for up
5350JMP m4
5360.m3 LDA #10      \ Prime for down
5370.m4 JSR cmv      \ move up/down
5380RTS \ ** END OF CURS **
5390 \***** START OF CURSOR MOVER *****
5400.cmv LDX &7D     \ No of moves
5410.c1 BEQ c2       \ branch if all done
5420JSR oswerch      \ move cursor
5430DEX              \ decrease counter
5440JMP c1
5450.c2 RTS \ ** END OF CMV **
5999 \***** UTILITY ROUTINES *****
6000 .DtoO LDY #7      \ copies D% to ochr%
6010 .z1 LDA D%,Y
6020 STA ohr%,Y
6030 DEY
6040 BPL z1
6050 RTS \ ** END OF D to O **
6060 .dtoD LDY #7      \ copies d% to D%
6070 .z2 LDA d%,Y
6080 STA D%,Y
6090 DEY
6100 BPL z2
6110 RTS \ END OF d to D **
6120 .Dtod LDY #7      \ copies D% to d%
6130 .z3 LDA D%,Y
6140 STA d%,Y
6150 DEY
6160 BPL z3
6170 RTS \ END OF D to d
6180]
6190 NEXT
7000 MODE 4
7010VDU 23;8202;0;0;0
7020VDU 5
7030 VDU 23,225,24,60,90,126,60,24,60,66
7040a$="Testing": GOSUB 7500
7050a$=STRING$(7,CHR$225):GOSUB 7500:GOTO 7040
7500Y%=0:X%=0:PRINTTAB(16,11);:CALL gchar,a$
7510X%=1:PRINTTAB(15,17);:CALL gchar,a$
7520X%=2:PRINTTAB(22,17);:CALL gchar,a$
7530X%=3:PRINTTAB(23,11);:CALL gchar,a$
7540Y%=1:X%=0:PRINTTAB(12,6);:CALL gchar,a$
7550X%=1:PRINTTAB(12,17);:CALL gchar,a$
7560X%=2:PRINTTAB(25,22);:CALL gchar,a$
7570X%=3:PRINTTAB(25,11);:CALL gchar,a$
7580Y%=2:X%=0:PRINTTAB(16,9);:CALL gchar,a$
7590X%=1:PRINTTAB(10,20);:CALL gchar,a$
7600X%=2:PRINTTAB(22,20);:CALL gchar,a$
7610X%=3:PRINTTAB(28,8);:CALL gchar,a$
7620Y%=3:X%=0:PRINTTAB(12,4);:CALL gchar,a$
7630X%=1:PRINTTAB(7,20);:CALL gchar,a$
7640X%=2:PRINTTAB(25,25);:CALL gchar,a$
7650X%=3:PRINTTAB(30,8);:CALL gchar,a$
7660 B$="Press":X%=0:Y%=3:PRINTTAB(6,30);:CALL gchar,B$
7670  B$="the":Y%=2:PRINTTAB(17,30);:CALL gchar,B$
7680 B$="SPACE":Y%=3:PRINTTAB(21,30);:CALL gchar,B$
7685 B$="BAR":Y%=1:PRINTTAB(32,30);:CALL gchar,B$
7690PRINTTAB(1,1): REPEAT UNTIL GET=32
7700 RETURN
9000 DATA &3C0A2C00,&3A092A00
9010 DATA &7C3A2C30,&7A392A30
```




BBC MICRO (A&B)

SPACE ADVENTURE (Mode 1) Machine Code 32K £7.95
Excellent high resolution colour graphics and most amazing animation. Intriguing mix of Invaders, Adventure and Maze. Search the alien ship for Power Crystals, Electronic Keys and Power Packs but shoot the Androids before they shoot you!

MIDDLE KINGDOM (Mode 7) Basic and Machine Code £7.95
Unique real-time graphic adventure with over 300 rooms and 6 scenarios. Defeat the monsters with magic spells or by brute strength and retrieve the lost magical treasures of Hylem.

SPACE INVADERS (Mode 5) Machine Code £7.95
Outstanding colour graphics and smooth movement. Full arcade features include 1 or 2 players, 3 different Invaders, bonus, 6 levels, spinning space ship, barriers, high score, sound.

WORD PROCESSOR PACKAGE (Pro Word) Machine Code £19.95
Easy to use, commands assigned to function keys. With full on-screen editing. Features include menu, insert, delete, copy, move, justify, tab settings, LR margins, full printer options. Complete with instruction manual. SAE for details.

All programs are supplied on high quality data cassettes. Prices are inclusive, no extras. Orders despatched by first class post within 3 days of receipt of order. Buy any two programs for the BBC or Atom and deduct £1 from the total.

SAE for the full BBC catalogue. Dealer enquiries welcome.

ATOM Space Adventure, Invaders, Air Strike £6 each. Eliza, Life, Reversi £3 each. SAE for catalogue.

PRO SOFTWARE BBC

121 TYN-Y-TWR
BAGLAN
PORT TALBOT
WEST GLAMORGAN
SA12 8YE

MAIL ORDER ONLY

CompUtopia LIMITED

At last — a printer for every Pocket!

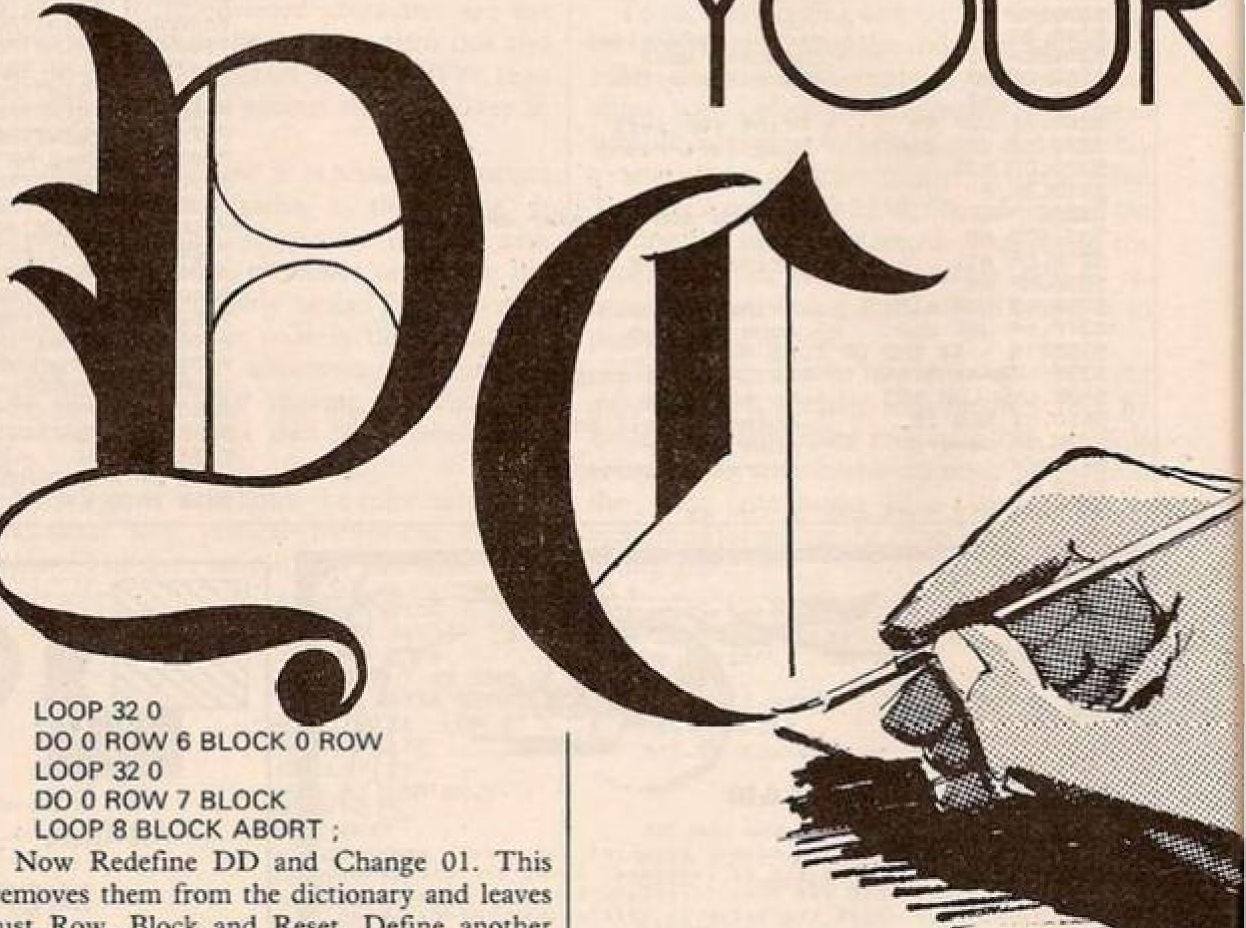
MICROMAX — SPECIAL
INTRODUCTORY OFFER
ONLY £69 + VAT

SPEED SELECTABLE . . . .
SERIAL OR PARALLEL
INTERFACES AND CABLES
AVAILABLE FOR:
SINCLAIR ZX 81
SPECTRUM
VIC . . . DRAGON ETC . . .

UP TO 24 STANDARD OR
ENHANCED CHARACTERS
PER LINE . . . .

s.a.e. please for details to 30 Lake Street
LEIGHTON BUZZARD Beds Tel 0525 376600

CHARACTER EXERCISES FO[R] YOUR



THE SPEED of Forth and being able to redefine standard graphic characters are features of the Jupiter Ace which make it ideal for improved quality printing — either on screen or on paper — a parallel printer has been promised by Jupiter Cantab.

The *Jupiter Ace Handbook* explains that the character set is contained in RAM addresses 11264 to 12287. These characters can be changed by writing new values into this RAM, but cannot be read back again. The initial character set is created from the ROM when the computer is switched on. The raw data to generate the characters is contained in ROM bytes 7547 to 8187 which consist of an abbreviated set of ASCII characters 32 to 127. If you want to see this data, define the words DD and Change01 as follows:

```
: DD
 DUP 16 + DUP ROT
 DO
  I C@ 256 + 2 BASE C!
  . DECIMAL 32 EMIT I . CR
 LOOP ;
: CHANGE01
 11264 48 8 * + 8 0
 DO
  DUP 128 SWAP C! 8 +
  DUP 255 SWAP C! 7 -
 LOOP
 1- 255 SWAP C! ;
```

Now enter

```
CHANGE01 INVIS CLS 7547 DD
```

and enter further DD as required. The program displays the ROM data in succession — with an additional character on the left-hand side — and the byte number at the right. The word Change01 has turned the character 0 into a black square and the character 1 into a white square, so that the ASCII characters are readily discernible.

If you look carefully at this section of ROM, you will see that the ASCII characters 32 to 62 copy seven bytes at a time. The top line of each character is a zero byte. ASCII characters 63 to 94 only use six bytes each with zero top and bottom, while 95 to 126 use seven as before. Finally character 127 uses all eight bytes.

When you have finished looking at the ROM, enter Abort to clear the data stack.

The ROM data provides a very simple means of returning any character set you may have devised back into the original form. For example, we do not want 0s and 1s to look like black and white squares for the rest of their lives. The word Reset emulates the action of the computer when it is first switched on, restoring to original any altered characters between 32 and 127.

Two utility words are needed — ROW which enters a single byte where ordered, and Block, which copies a prescribed block of data from the ROM.

```
: ROW
 OVER C! 1+ ;

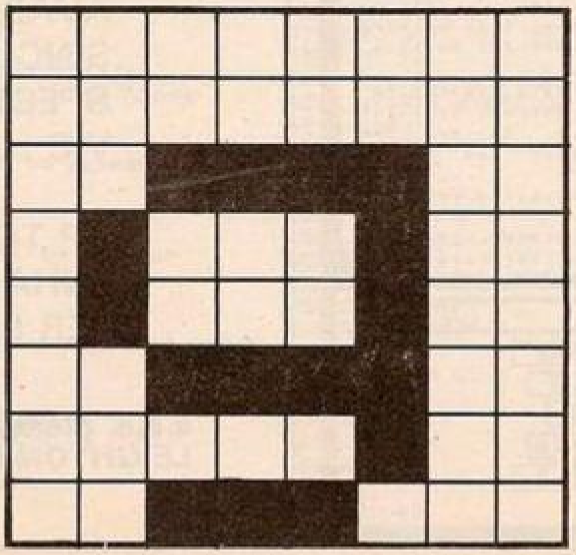
: BLOCK
 0 DO
  OVER C@ ROW SWAP
  1+ SWAP
 LOOP ;

: RESET
 7547 11520 31 0
 DO 0 ROW 7 BLOCK
 LOOP 32 0
 DO 0 ROW 6 BLOCK 0 ROW
 LOOP 32 0
 DO 0 ROW 7 BLOCK
 LOOP 8 BLOCK ABORT ;
```

Now Redefine DD and Change 01. This removes them from the dictionary and leaves just Row, Block and Reset. Define another word Test to display all the characters on the screen:

```
: TEST
 127 32
 DO I EMIT
 LOOP 4 1
 DO I EMIT
 LOOP ;
```

BEFORE



You will notice that three graphic characters appear at the end — we will need to look at these later on; they will be changed into something more useful.

Examine the letters critically — several things detract from their appearance: the lines of writing are too close together; some lower case letters seem to be too short, not lining up with the top of the other letters; and the descenders — the tails that are supposed to fall below the line — hardly descend at all.

To overcome crammed writing one simple remedy is to print a blank line between lines of type. At first this might appear to space the lines out too far, but if the blank lines are used to draw better descenders and we increase the size of the capitals, the spacing looks just right.

The word Capital increases the height of ASCII characters 63 to 94 — it simply doubles

R-FORMING OR ACE



Roger Liddiard's programs will help convert your deformed characters into true descenders of the Ace

up on the top two lines of the characters:

```
: CAPITAL
  7764 11768 32 0
  DO 2 BLOCK SWAP
    4 + SWAP 6 +
  LOOP DROP DROP ;
```

The offending lower-case letters are stretched in a similar manner to smooth out their tops:

```
: LCASE
  1 1 4 4 4 1 4 1 4 1 4 7977 12048 11 0
  DO 3 PICK BLOCK 3 PICK -
    SWAP ROT - 7 + SWAP 8 +
  LOOP DROP DROP ;
```

Now to put proper tails on your letters. The letters g, j, p, q and y are re-defined and their tails are drawn in graphic characters 1, 2 and 3. Yes, you only need three tails — those of g, j, and y are the same.

The word Descenders makes this transformation — of course the tails are lost until we double space the typing, but you can see them being formed in the last three characters of Test.

```
: DESCENDERS
  4 6 64 64 56 68 11272
  DUP 24 0
  DO 0 ROW
  LOOP DROP 3 0
  DO 2 0
    DO SWAP ROW
    LOOP 6 +
  LOOP DROP
  8141 12237 8085 12173 8078 12165
  8035 12117 8015 12093 5 0
  DO 3 BLOCK DROP DROP
  LOOP ;
```

If your Jupiter Ace has no additional memory, you will soon be running out of space, but do not worry — once the new set of characters has been formed, we can clear the dictionary and start again with some new words. So Save what we have done so far, then enter

```
CAPITAL LCASE DESCENDERS FORGET
RESET
```

which should clear out the dictionary — check it with VList. Now the finale.

Start by entering two utilities:

```
32 VARIABLE NN
: PRINT ;
```

Then define the word DType. It is quite long but its effect is dramatic:

```
: DTYPE
  32 NN ! FIND DUP 6 + SWAP 5 - @ 13 -
  BEGIN
    DUP 32>
      IF
      ELSE DUP NN !
      THEN NN @ 0 >
  WHILE
    BEGIN
      INKEY DUP 80 =
      IF PRINT
      THEN
    UNTIL NN @ - SWAP DUP NN @ +
    SWAP NN @
    TYPE SWAP 32 NN @ - SPACES 32 0
    DO 113 113 113 112 112 121 106 103
      0 15388 @ 32 - C@ 8 0
      DO DUP 4 ROLL = ROT + SWAP
      LOOP DROP DUP
        IF
        ELSE DROP 32
        THEN EMIT
      LOOP
      REPEAT DROP DROP ;
```

DType is used in conjunction with a word containing text. It starts on a new line so the text is best arranged in complete paragraphs. The first 32 letters are typed out, followed by a line of blanks and descenders. It then waits for you to press any key before repeating the process with the next 32 letters. This control facility is very useful when you need to control the amount of text you wish to display, for example when a printer is used to copy a screenful of text. A dummy word Print has been included — if the letter P is pressed this subroutine is called up — it will be useful in the future. To use DType, define some text such as

```
: P1 ." abcdefghijklmnop etc. " ;
```

preferably with more than one line of characters. Because DType uses the word Find, and calculates the length of text in P1, another word must appear in the dictionary after P1, otherwise the bytes in P1's header which define its length, will not be complete. So add a dummy word :P2 ; on the end.

Now enter

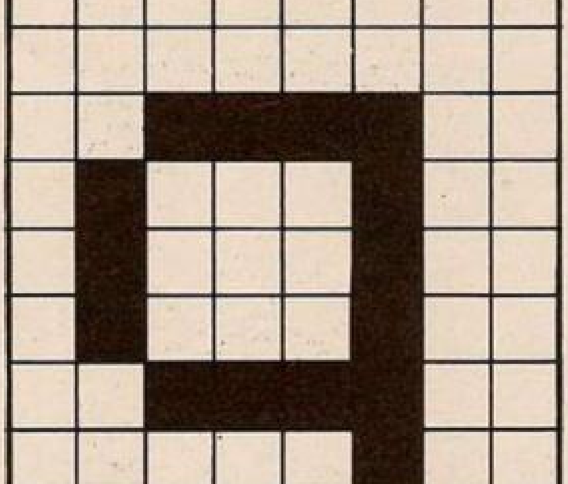
```
INVIS CLS DTYPE P1
```

when the first line is complete, press any key and the next line will appear. The advantages of storing text in colon definitions are that the length of text is not limited to 256 characters and full Edit facilities are available. In addition, memory space is not wasted in defining new words such as String. Successive paragraphs can be displayed by means of

```
DTYPE P1 DTYPE P2 DTYPE P3 etc.
```

and paragraphs can be interspersed with additional blank lines by the use of CR as required. Your text can be Saved on tape in the normal manner. ■

AFTER



THIS PROGRAM will run only on the 1K ZX-81, and so RAM packs must be disconnected before the program is loaded. Before entering the machine code, space must be reserved for it. The easiest way to do this is with Rem statements, so type in lines 1 and 2 as:

```
1 REM 344 zeros
2 REM 167 zeros
```

It is advisable to enter lines 1 and 2 in Fast mode.

When the Rem statements are complete, enter the following hex code loading program.

```
10 LET X = 16514
20 LET A$ = ""
30 IF A$ = "" THEN INPUT A$
40 IF A$ = "S" THEN STOP
50 PRINT AT 0,0;X,A$ ( TO 2 )
60 POKE X, 16*CODE A$ + CODE A$ (2)
   - 476
70 LET X = X + 1
80 LET A$ = A$ ( 3 TO )
90 GOTO 30
```

Run the program, and in response to the input prompt enter the bytes in the column on the left-hand side of the address column — each two characters make one byte. For example, one may enter the first five bytes of the machine code in a block or one byte at a time, thus:

2A3240 NEWLINE 54 NEWLINE 5D NEWLINE

and so on. Do not enter any spaces with the hex codes. Take your time when entering the machine code, as one wrong byte could cause disaster. If at any time you make a mistake, break out by inputting a single S. Then type in line 10 again, but this time with an address you know to have been correctly loaded. Then continue from that address by running the program.

When all of the machine code has been entered, break out by entering a single S, and then type in line three as:

```
3 RAND USR 16530
```

then delete lines 10 to 90.

Now Save the program before running it. After saving the program, type in, as direct commands

```
RAND
```

then

```
RUN
```

If everything is running happily, your jet should be resting on a flat area of landscape ready for take off, a hilly landscape should be moving towards you, and the flak should be moving across the screen. If your aeroplane *collides with the hillside it will explode*, stopping the program.

Keys 1,2,3,4,5,Q,W,E,R, and T move your plane up, and keys A,S,D,F,G,Z,X,C, and V move it down. Keys 6,7,8,9,0,Y,U,I,O,P drop a bomb from the jet. Shooting a base — represented by an A — earns you 10 points.

If something has gone wrong, turn off the power supply and then reload the program from tape. To debug it, enter the following program:

```
10 FOR F = 16514 TO 17030
20 LET X = PEEK F
30 PRINT CHR$ (INT (X/16) + 28);
   CHR$ (X - INT(X/16) * 16 + 28)
40 NEXT F
```

and run it. The machine code is displayed 22 bytes at a time. After checking each byte for errors, enter:

```
CONT NEWLINE
```

for the next 22. When an incorrect byte is found, correct it by Poking its address with the decimal equivalent of the correct byte — see conversion tables at the back of the ZX-81 manual. When debugging is complete, delete lines 10 to 40. To speed the game up, Poke address 16627 with a number between 1 and 15; to slow the game down, Poke address 16627 with a number between 16 and 255.



16514	2A
16515	32
16516	40
16517	54
16518	5D
16519	29
16520	29
16521	19
16522	29
16523	29
16524	29
16525	19
16526	22
16527	32
16528	40
16529	C9
16530	3E
16531	1C
16532	06
16533	06
16534	D7
16535	10
16536	FD
16537	3E
16538	76
16539	D7
16540	0E
16541	09
16542	3E
16543	00
16544	06
16545	13
16546	D7

16547	10
16548	FD
16549	3E
16550	76
16551	D7
16552	0D
16553	20
16554	F3
16555	0E
16556	02
16557	3E
16558	08
16559	06
16560	13
16561	D7
16562	10
16563	FD
16564	3E
16565	76
16566	D7
16567	0D
16568	20
16569	F3
16570	2A
16571	0C
16572	40
16573	11
16574	AA
16575	00
16576	19
16577	36
16578	B6
16579	23

16580	36
16581	82
16582	2A
16583	0C
16584	40
16585	11
16586	07
16587	00
16588	19
16589	11
16590	40
16591	40
16592	06
16593	06
16594	C5
16595	01
16596	14
16597	00
16598	EB
16599	73
16600	23
16601	72
16602	23
16603	EB
16604	09
16605	C1
16606	10
16607	F2
16608	2A
16609	0C
16610	40
16611	11
16612	AA
16613	00
16614	19
16615	22

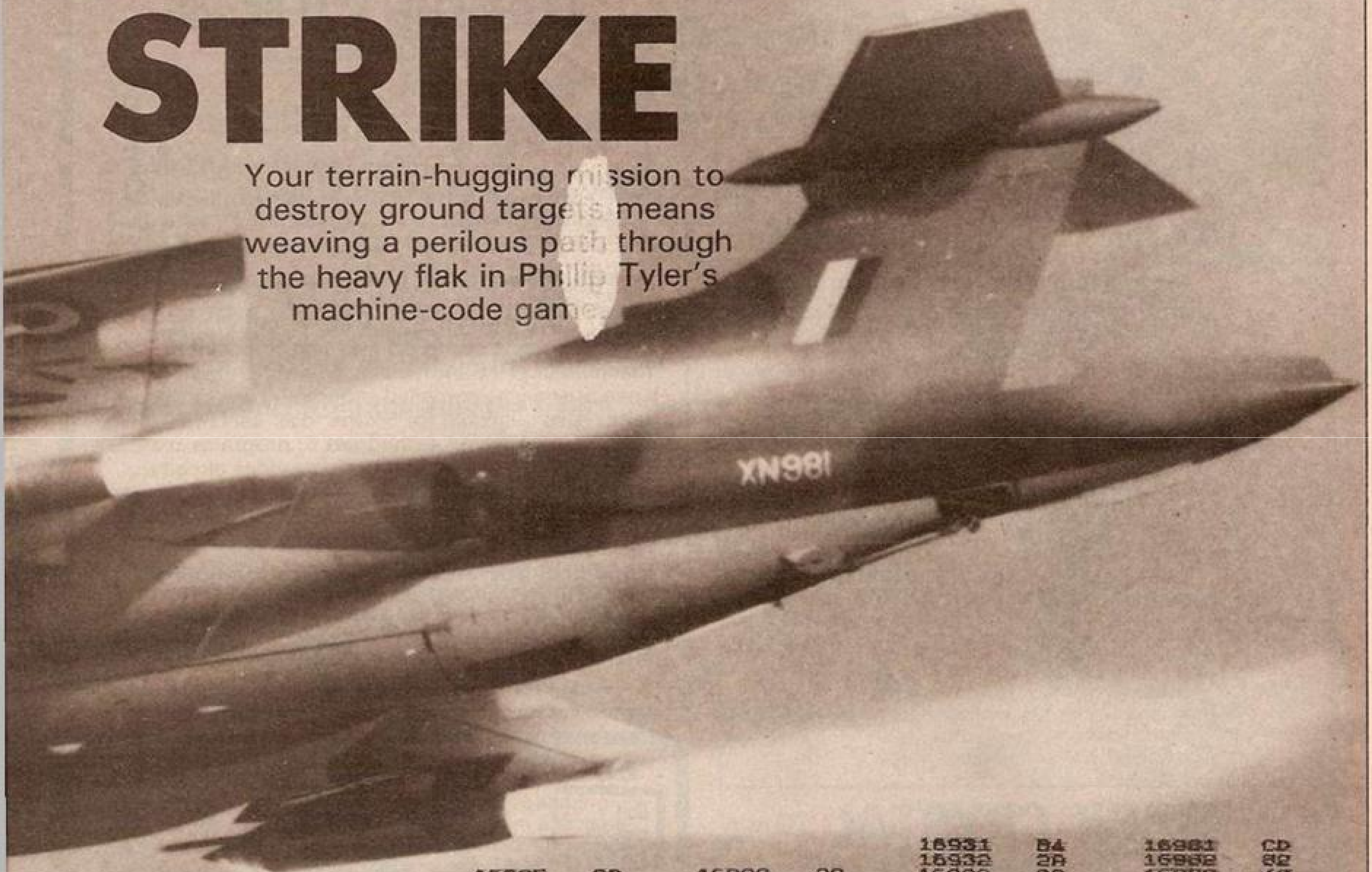
16616	3C
16617	40
16618	11
16619	12
16620	00
16621	19
16622	22
16623	3E
16624	40
16625	01
16626	00
16627	10
16628	0B
16629	78
16630	FE
16631	00
16632	20
16633	FA
16634	3A
16635	4C
16636	40
16637	3C
16638	32
16639	4C
16640	40
16641	CB
16642	47
16643	28
16644	77
16645	2A
16646	0C
16647	40
16648	11
16649	80
16650	00
16651	19
16652	0E
16653	03
16654	54

16655	5D
16656	23
16657	06
16658	12
16659	7E
16660	FE
16661	86
16662	28
16663	0C
16664	FE
16665	82
16666	20
16667	04
16668	3E
16669	86
16670	18
16671	11
16672	FE
16673	1B
16674	20
16675	04
16676	3E
16677	00
16678	18
16679	09
16680	FE
16681	00
16682	20
16683	05
16684	1A
16685	FE
16686	82
16687	20
16688	F3
16689	12
16690	23
16691	13
16692	10
16693	DD
16694	23
16695	0D
16696	20
16697	D4
16698	11

16699	12
16700	00
16701	19
16702	E5
16703	CD
16704	82
16705	40
16706	44
16707	3E
16708	01
16709	3C
16710	FE
16711	05
16712	20
16713	02
16714	3E
16715	01
16716	10
16717	F7
16718	47
16719	E1
16720	11
16721	EC
16722	FF
16723	36
16724	08
16725	19
16726	10
16727	FB
16728	FE
16729	04
16730	28
16731	20
16732	F5
16733	E5
16734	CD
16735	82
16736	40
16737	7C
16738	FE
16739	32
16740	E1
16741	30
16742	02

ZX-81 GROUND STRIKE

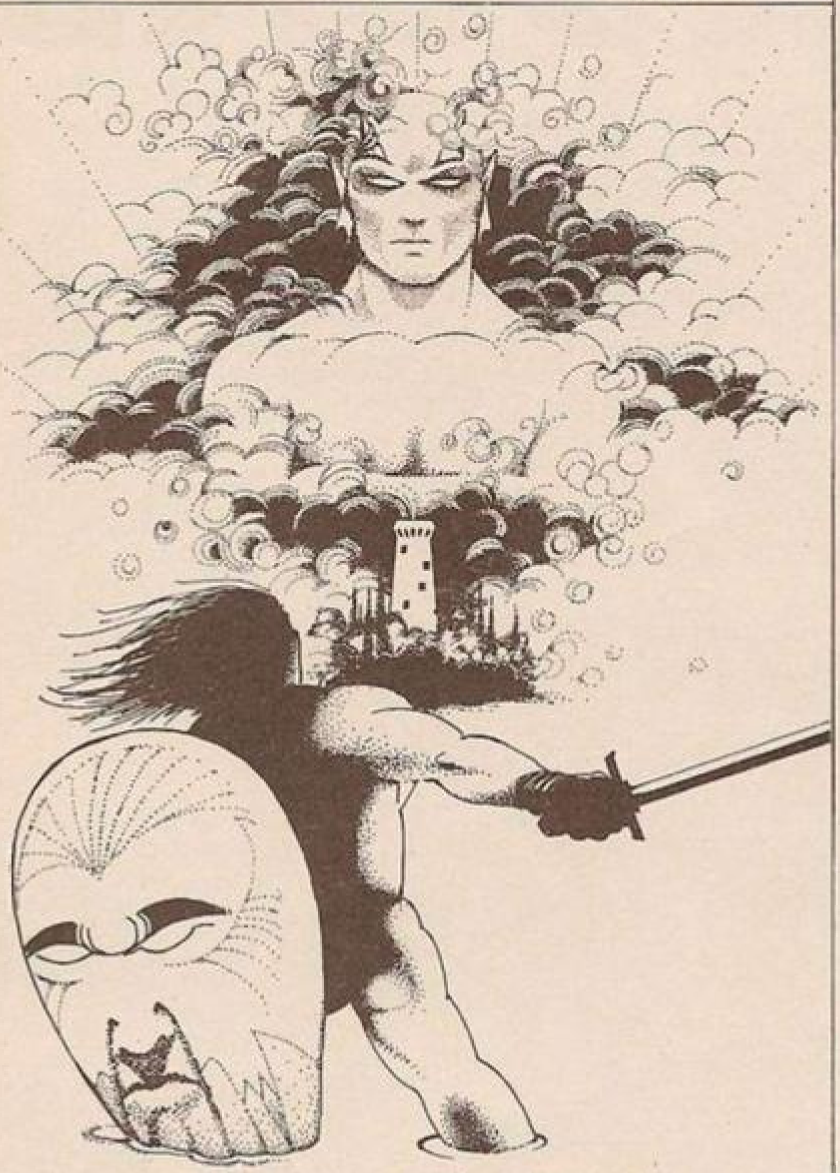
Your terrain-hugging mission to destroy ground targets means weaving a perilous path through the heavy flak in Phillip Tyler's machine-code game.



16743	36
16744	26
16745	F1
16746	3C
16747	47
16748	3E
16749	04
16750	90
16751	47
16752	FE
16753	00
16754	28
16755	08
16756	11
16757	EC
16758	FF
16759	19
16760	36
16761	00
16762	10
16763	FB
16764	2A
16765	3C
16766	40
16767	23
16768	7E
16769	FE
16770	82
16771	28
16772	03
16773	2B
16774	18
16775	4A
16776	CD
16777	BB
16778	02
16779	CB
16780	45
16781	28
16782	04
16783	CB
16784	4D
16785	20
16786	05
16787	11
16788	14
16789	00
16790	18
16791	0B
16792	CB
16793	55
16794	28
16795	04
16796	CB
16797	5D
16798	20
16799	38
16800	11
16801	EC
16802	FF
16803	2A
16804	3C
16805	40
16806	36
16807	00
16808	23
16809	36
16810	00
16811	19
16812	7E
16813	FE
16814	00
16815	20
16816	11
16817	2B
16818	7E
16819	FE
16820	00
16821	20
16822	0B
16823	36
16824	86
16825	23
16826	36
16827	82
16828	2B
16829	22
16830	3C
16831	40
16832	18
16833	16
16834	2A
16835	3C
16836	40
16837	FE
16838	08
16839	28
16840	08
16841	FE
16842	26
16843	28
16844	04
16845	FE
16846	34
16847	20
16848	E6
16849	19
16850	36
15851	17
16852	23
16853	36
16854	17
16855	C9
16856	18
16857	06
16858	76
16859	00
16860	02
16861	A9
16862	00
16863	EA
16864	CD
16865	BB
16866	02
16867	CB
16868	65
16869	28
16870	04
16871	CB
16872	64
16873	20
16874	0E
16875	2A
16876	3E
16877	40
16878	7E
16879	FE
16880	00
16881	20
16882	06
16883	2A
16884	3C
16885	40
16886	23
16887	18
16888	3E
16889	2A
16890	3E
16891	40
16892	06
16893	00
16894	7E
16895	FE
16896	08
16897	28
16898	21
16899	FE
16900	26
16901	20
16902	17
16903	36
16904	00
16905	2A
16906	0C
16907	40
16908	11
16909	05
16910	00
16911	19
16912	7E
16913	3C
16914	FE
16915	26
16916	20
16917	05
16918	36
16919	1C
16920	2B
16921	18
16922	F5
16923	77
16924	18
16925	06
16926	FE
16927	34
16928	20
16929	0E
16930	36
16931	B4
16932	2A
16933	0C
16934	40
16935	11
16936	BC
16937	00
16938	19
16939	22
16940	3E
16941	40
16942	18
16943	14
16944	78
16945	FE
16946	00
16947	20
16948	0A
16949	36
16950	00
16951	11
16952	15
16953	00
16954	19
16955	06
16956	50
16957	18
16958	BF
16959	36
16960	1B
16961	22
16962	3E
16963	40
16964	21
16965	40
16966	40
16967	06
16968	06
16969	C5
16970	5E
16971	23
16972	56
16973	E5
16974	EB
16975	7E
16976	FE
16977	76
16978	20
16979	18
16980	E5
16981	CD
16982	82
16983	40
16984	7C
16985	E1
16986	FE
16987	28
16988	30
16989	1C
16990	11
16991	13
16992	00
16993	19
16994	18
16995	14
16996	36
16997	00
16998	FE
16999	B4
17000	20
17001	08
17002	2B
17003	7E
17004	FE
17005	76
17006	20
17007	FA
17008	18
17009	08
17010	2B
17011	7E
17012	FE
17013	76
17014	28
17015	02
17016	36
17017	34
17018	EB
17019	E1
17020	72
17021	2B
17022	73
17023	23
17024	23
17025	C1
17026	10
17027	C5
17028	C3
17029	F1
17030	40

■

SPECTRUM 48K : ZX81 16K
SIX PART ADVENTURE



BLACK CRYSTAL
THE QUEST IS ABOUT TO BEGIN

The ultimate role-playing adventure for the SPECTRUM/ZX81. You can become a warrior, elf or wizard on a quest to find and use the rings of creation: to destroy the Black Crystal and defeat the Lords of Chaos. Held within six programs lies a land of fabulous treasures and mythical monsters. Journey through the land of Beroth, explore the castle of shadows, descend into the Shaggoths lair, search for diamonds in the sea of sand but beware of sand sharks! Confront the fire demon in his temple, battle against the Lords of Chaos and win your way to the Black Crystal.

By splitting Black Crystal into six programs we can provide more variety and detail than any other adventure for the Sinclair computers.

Real time monster battles. Superb graphics. Save game feature. All six parts are supplied together on cassette, boxed with instruction booklet.

SPECTRUM 48K: 180K OF PROGRAM IN SIX PARTS — ONLY £7.50
ZX81 16K: OVER 100K OF PROGRAM IN SEVEN PARTS — ONLY £7.50
WHY PAY MORE FOR LESS OF AN ADVENTURE

CARNELL SOFTWARE

To: **CARNELL SOFTWARE, DEPT 2, 4 STAUNTON RD, SLOUGH. SL2 1NT.**
Please send me: Black Crystal for my,

☐ Spectrum 48K................ £7.50
☐ ZX8 16K...................... £7.50

I enclose a cheque/postal order (payable to Carnell Software) for £ ______

NAME..

ADDRESS..

....

TRADE ENQUIRIES WELCOME

64 PROTEUS SOFTWARE *64*

FOR THE C.B.M. 64
IN MACHINE CODE

	£.pp
A, PLANE LANDER	8.00
B, NIM AND LINE UP 4	7.50
C, FRUIT MACHINE	5.70
D, HANGMAN WORDS & MATHS	6.50
E, SPACE NUMBERS	7.00
F, BATTLE SHIPS	7.50
G, PROTEUS CHALLENGE	8.00

All programs available on 5¼ ins. disc add £4.00
All progrms on one disc for £45.00

SPECIAL SERVICE only £8.00 per program
Your programs compiled into fast, efficient machine code. Send your programs on tape for speedy service, compiled programs sent on new tape. Also available for 5¼ ins. disc users £12.00 (max. no. of errors de-bugged 5, programs may not contain any machine code routines already). No liability accepted for tapes damaged in process. Send SAE for details. Trade enquiries welcomed.

Make cheques or P/O payable to:
PROTEUS SOFTWARE, 8 GLASGON COURT, GRANGE ROAD, LONDON, W5 5QR.

orders usually despatched within 7 days of receipt of order, for use with **CBM 64 only.**

e = educational

EDUCATIONAL COMPUTING
on the
ZX81

Suit children ages 5-11

strongly recommended by educational authorities

No comparable collection offers so much for so little

Fifty high-quality programs to turn your ZX81 or Spectrum into a powerful educational tool.
And you don't even need to know programming. There are clear instructions and plenty of tips & advice. Designed to go beyond drill & practice the promote learning through interaction & discovery.

Almost all programs work on the **SPECTRUM**

All programs fit 1K
Creative use of graphics
Many innovative ideas
Fully documented
Includes many games

Educare's **50** 1K PROGRAMS for PRIMARY EDUCATION

Includes:-
TORTOISE
A simplified version of the famous Turtle programme
CODED MISSILE
Combines the fun of arcade games with learning

£5·95 only
paperback 110 pages plus Spectrum supplement

Graph-plotter ● Histogram ● Simon-spell ● Sketchboard ● Times-table ● Sets
Series-quiz ● XY-coordinates ● Count ● Equations ● Areas ● Guess-a-Volume
Angles ● Upstairs-Downstairs ● Music-notes ● See-saw ● Wipe-out ● Spell
Temperature ● Clock ● Money ● Snake
Mastermind ● Number-shoot ● +26 more

EDUCARE

To: EDUCARE
139a Sloane St.
London
SWIX 9AY

Please send me .... copies Educare's 50.
I enclose cheque/postal order for £ ....
Name..
Address..
....

Let your child benefit early - Send now

Introducing -

CP SOFTWARE

SUPER CHESS II

For Sinclair 48K SPECTRUM

THE BEST at £7·95

Specialists in high quality, intelligent games

CP SOFTWARE Spectrum software

Guaranteed able to beat Sargon II and all other Spectrum chess programs !!!

- **Six levels of play**
- **Plays a variety of openings e.g. French Defense, Sicilian Defense, Ruy Lopez, Queen's Gambit etc.**
- **Self play mode**
- **Analyse mode**
- **Enhanced end-game play**
- **Recommended move option**

Proof of the superiority of SUPERCHESS II is available in the form of listings of 10 consecutive games played against other well known Spectrum Chess programmes. SUPERCHESS II 8 wins, Spectrum Chess 1 win and 1 draw. The listings are free with each program or 40p on their own.

Available only from the address below – dealer enquiries welcome

●● ORIGINAL SUPERCHESS ●●

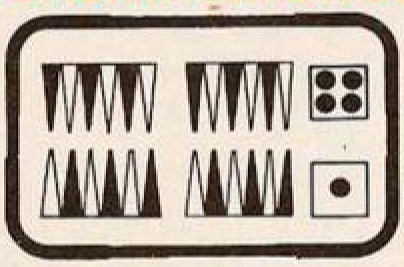
The Cheapest

10 levels of play: recommended move option: substantial 'opening book' e.g. French Defense, Queen's Gambit, Ruy Lopez etc: Self play feature: analyse mode. **48k Spectrum £4.95**
16k ZX81 £4.95

●● ZX DRAUGHTS ●●

The game for everyone, played at level O it replies immediately, can you beat it at level 9?
Draughts is an ideal game to apply tree searching techniques to. Our machine code program analyses each position in depth making it a formidable opponent. Choice of colour and search strategy. 10 levels of play, at level 4 (response time – 20 seconds) it beats its own programmer! **48k Spectrum £6.95**

●● BACKGAMMON ●●



Play this fascinating game of skill and chance. High resolution colour display with dice roll. Can be used by expert players and also has documentation to enable beginners to learn the game. **48k Spectrum £5.95**

●● SPECTRUM SPEECH ●●

Yes it's possible! Software driven speech from the Spectrum. Simple to use in your own programs. Each cassette comes with user documentation and demonstration program. No extra hardware is required. Uses Spectrum speaker and top 32k Ram.

SOFTALK I: 'Multiwords' 70 plus words, numbers zero to million, plus, go, limit, right, great etc.......... **48k Spectrum £6.95**

SOFTALK II: 'Spacegames' 80 plus words, numbers, red alert, torpedoes, phasors, bearing south etc......... **48k Spectrum £6.95**

●● BEEPER AMPLIFIER ●●

Boost your Spectrum's beeper. This neat amplifier, with volume control, plugs directly into the Spectrum's EAR or MIC socket using the tape lead. NO OTHER CONNECTIONS NECESSARY. Powered by a PP3 battery (not supplied) it doubles as a radio when not used with your Spectrum. **£5.95 or only £4.95** when purchased with a SOFTALK program. Please add 35p to cover p&p.

●● SPECTRUM ASSEMBLER ●●

An essential aid for m/c programmers. User documentation supplied with each cassette.
16k and 48k Spectrum £4.95

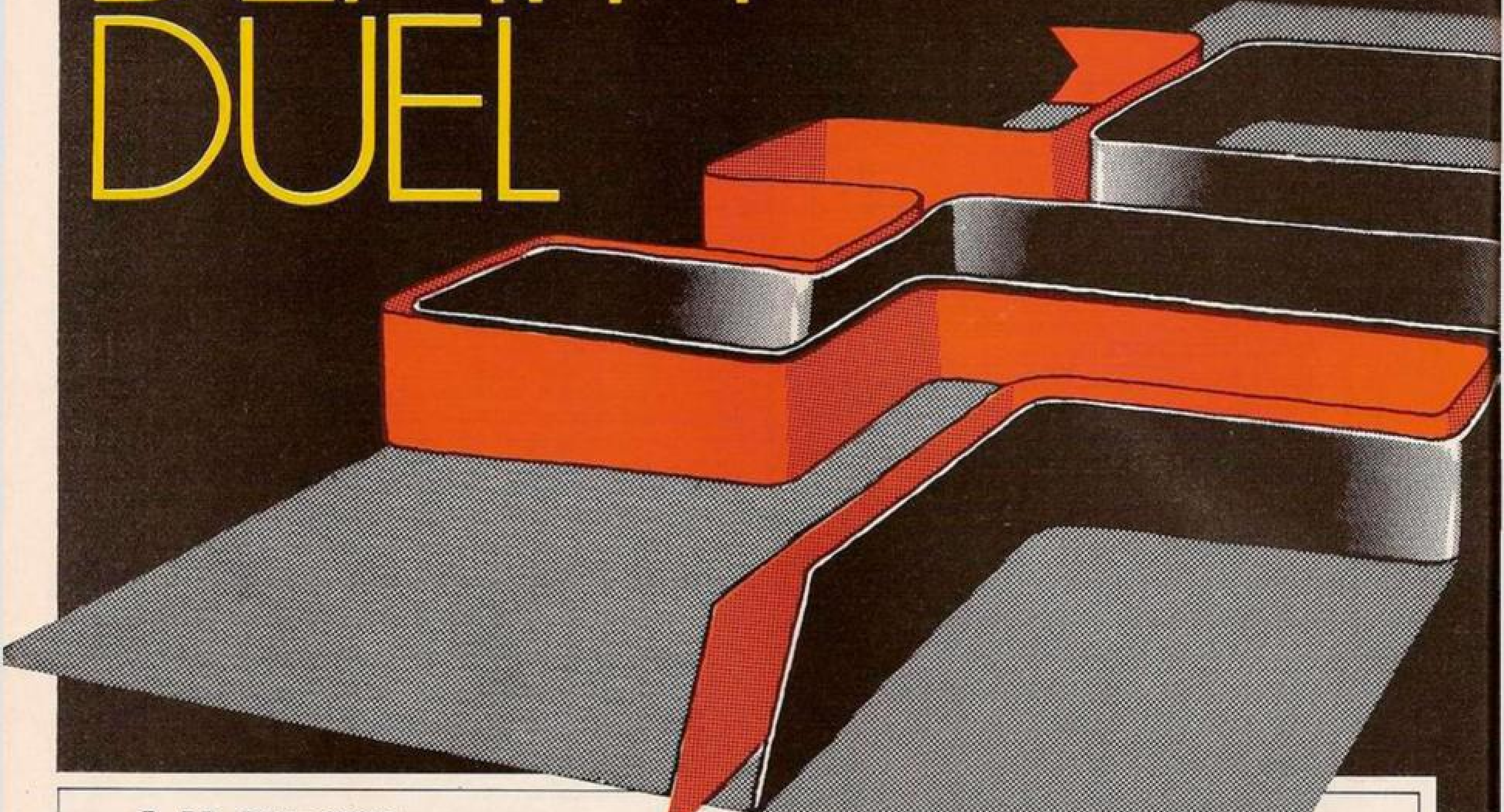
★ VISIT US ON STAND S6 at the MIDLAND COMPUTER FAIR BIRMINGHAM April 28th – 30th ★

UK Prices include post & packing. Despatch within 48 hours of receipt of order.
(For orders outside UK add 80p for postage).
Send cheque or postal order to:

CP SOFTWARE, Dept.YC, 17 Orchard Lane, Prestwood, Bucks. HP16 0NN

PROGRAMMERS – TOP RATES PAID FOR HIGH QUALITY SPECTRUM STRATEGY GAMES AND SPECTRUM FORTH. SEND YOUR MATERIAL FOR EVALUATION AND PROMPT REPLY.

SPECTRUM DEATH DUEL



```
  2 GO SUB 9000
  3 GO SUB 8000
  5 LET s1=0: LET s2=0
  8 REM
  9 REM 2 Lines of 32 Graphic 8
 10 PRINT AT 0,0;"████████████████████████████████████████████████████████████████"
 20 PRINT AT 20,0;"████████████████████████████████████████████████████████████████"
 24 REM
 25 REM 2 Lines of 32 Graphic A
 30 PRINT AT 21,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
 40 PRINT AT 1,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
 44 REM
 45 REM Graphic 8, 30 Graphic b
, Graphic 8
 50 FOR f=2 TO 19: PRINT AT f,0
;"█▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌█"
 60 NEXT f
 70 LET x=4: LET y=10
 80 LET a=27: LET b=10
 90 LET d=2: LET c=4
 95 GO TO 100+60*(RND<.5)
 110 LET a$=("1" AND IN 63486<>2
55)+("2" AND IN 64510=253)+("3"
AND IN 65022<>255)+("4" AND IN 6
4510=254)
 120 IF LEN a$=1 THEN LET d=VAL
a$
 125 LET x=x+(d=2)-(d=4): LET y=
y+(d=3)-(d=1)
 126 IF SCREEN$ (y,x)<>"" THEN G
O TO 2000
 130 PRINT AT y,x; BRIGHT 1; INK
c1;"█": REM Graphic 8
 140 IF SCREEN$ (y+1,x)="" THEN
PRINT AT y+1,x; PAPER c1; INK c1
;"▒": REM Graphic A
 145 BEEP .01,0
 160 LET a$=("1" AND IN 61438<>2
55)+("2" AND IN 57342=254)+("3"
AND IN 49150<>255)+("4" AND IN 5
7342=253)
 170 IF LEN a$=1 THEN LET c=VAL
a$
 175 LET a=a+(c=2)-(c=4): LET b=
b+(c=3)-(c=1)
 176 IF SCREEN$ (b,a)<>"" THEN G
O TO 1000
 180 PRINT AT b,a; BRIGHT 1; INK
c2;"█": REM Graphic 8
 190 IF SCREEN$ (b+1,a)="" THEN
PRINT AT b+1,a; PAPER c2; INK c2
;"▒": REM Graphic A
 195 BEEP .01,10
 200 GO TO 100
```

GAMES

Force your opponent into a corner — that is your goal in this interactive game by Andrew Foord for the 16K ZX Spectrum.



Two people can play simultaneously using the keyboard — instructions are shown in the program. The players shoot along the grid leaving a trail of deadly orgone energy in their wakes. This manifests itself on the screen as a wall. To survive you must force your antagonist to career helplessly into either your wake or his own: both will prove equally fatal. The program gives a view of the action — looking from an angle of 45° — by using Bright to make the top of the trail brighter than the front. The player to win is the first to achieve a score of 10. Different trace elements can be injected into the energy-conversion cycle of your overlander to alter the colour of the exhausted field of primary energy you leave in your wake. You can have any colour you want as long as it is not black. To make the game really confusing the two players can even be the same colour.

```
1000 PRINT AT b,a; FLASH 1;" "
1010 LET s1=s1+1
1020 GO TO 3000
2000 PRINT AT y,x; FLASH 1;" "
2010 LET s2=s2+1
3000 FOR f=30 TO 60: BEEP .001,f
: NEXT f
3010 PRINT INVERSE 1;AT 9,11;"PL
ayer 1:";s1
3020 PRINT INVERSE 1;AT 11,11;"P
Layer 2:";s2
3030 FOR f=60 TO 30 STEP -1: BEE
P .001,f: NEXT f
3035 IF s1>9 OR s2>9 THEN GO TO
4000
3040 IF INKEY$<>"" THEN GO TO 30
40
3050 PRINT AT 20,3; INVERSE 1;"P
RESS ANY KEY TO CONTINUE"
3060 IF INKEY$<>"" THEN GO TO 10
3070 GO TO 3060
4000 PRINT FLASH 1;AT 13,10;"PLA
YER ";(s2=10)+1;" WINS"
4010 INPUT "Another go? "; LINE
a$
4020 IF a$="" THEN GO TO 4010
4030 IF a$(1)<>"n" THEN RUN
4040 STOP
8000 BORDER 0: PAPER 0: INK 7: C
LS
8010 PRINT "This is:"
8020 PRINT TAB 13;"CHASER"''TAB
9;"© ANDREW FOORD"
8030 PRINT '"The object of CHASE
R is to forcethe other player in
to a wall."
8040 PRINT '" Each player has a
chaser which leaves a trail, the
 chasers can not stop until one
is destroyed."
8050 PRINT 'TAB 12;"CONTROLS"
8051 REM ^-Graphic C, v-Graphic
D
8055 PRINT 'TAB 14;"^ < > v"
8060 PRINT '"Player 1.        2 Q W
 A"
8070 PRINT '"Player 2:        0 O P
 L"
8080 PRINT 'TAB 14;"^ < > v"
8100 INPUT "Players 1 colour? (1
 TO 7) ";c1
8110 IF c1<1 OR c1>7 THEN GO TO
8100
8120 INPUT "Players 2 colour? (1
 TO 7) ";c2
8130 IF c2<1 OR c2>7 THEN GO TO
8120
8140 RETURN
9000 FOR f=0 TO 7 STEP 2: POKE U
SR "a"+f,170: POKE USR "a"+f+1,8
5: NEXT f
9010 FOR f=0 TO 6: POKE USR "b"+
f,128: NEXT f: POKE USR "b"+7,25
5
9020 RESTORE : FOR f=0 TO 7: REA
D a: POKE USR "c"+f,a: POKE USR
"d"+7-f,a: NEXT f
9030 DATA 0,0,8,20,34,0,0,0
9040 RETURN
```

■

IMPACT SOFTWEAR

From Scotland's Capital comes quality software for the

ZX Spectrum, VIC 20 & now also Dragon 32

The Quest

(48K - Spectrum; Dragon 32)
(One of the most exciting adventure games currently available). Fight your way into the depths of the complex in your Quest for the Holy Grail. Discover Gold and Precious stones, buy weapons and Magic wares from a trader Battle with one of the many Monsters. Up to 1500 locations may be searched in the course of a game. Full sound effects and save game facility. Only £5.00

Star Trek

(16K Spectrum; 8K – VIC 20; Dragon 32)
Save the Galaxy from the Klingons using your rapid fire phasers and photon torpedos. Automatic short range scan, Galaxy map and Star-bases. Full sound effects and 10 levels of difficulty! Only £5.00

Orb

(48K – Spectrum; 16K – VIC 20; Dragon 32)
Make your way through the underground labarynth in your search for the dreaded Orb, which you must destroy. Encounter many Monsters, discover Treasure and try to remember your route so that you can get out again. Full sound effects and save game facility. Only £5.00

NEW! 3-D Maze

(48K – Spectrum; Dragon 32)
Exciting 3-Dimensional Maze Game! Search for the 3 fabulous treasures, then make your way back to the exit. Time yourself with the On Screen Clock But Beware the treasures are not always in the same locations. Only £5.00

Dealers Attractive Discounts
Spectrum & VIC 20 programmes wanted 25% Royalties Paid

Star fighter

(16K – Spectrum)
All action, full-colour, graphic machine-code, Space-battle with devastating explosions. On screen scoring and high score kept. The longer you survive the more difficult it becomes. Only £5.00

Games Pack (Unexpanded VIC 20)
Alien * Road Race *
The Island * Pontoon *
Only £5.00



ALL ORDERS DESPATCHED BY RETURN

I enclose a Cheque/PO for £ ......
Name ______
Address ______
______ Post Code ______
All prices include P&P and VAT

IMPACT SOFTWARE
70, Redford Avenue,
EDINBURGH EH13 0BW
TEL. 031-441-4257

Please Supply
The Quest (£5·00) ☐ 3-D Maze (£5·00) ☐
Orb (£5·00) ☐ Starfighter (£5·00) ☐
Star Trek (£5·00) ☐ Games Pack (£5·00) ☐
Please state machine type ______

IMPACT SOFTWEAR

From Scotland's Capital comes quality software for the

Destroyers 16 & 48K ZX Spectrum

New and original arcade game in real time. Written in high speed machine code with hi-res graphics, full colour and sound effects. Test your skill against the awesome and varying firepower of the different waves of the Destroyers. High score saved. £ 6·50

ZX TREK

48K ZX Spectrum

First quality star trek game in real time with hi-res graphics plus constant on screen display of galaxy map, long range scan, and statuas report.
Over twenty comands with full colour and sound effects.
This game provides a real challenge for the ZX Spectrum game player.



£ 6·50

IMPACT SOFTWARE
70 REDFORD Ave
EDINBURGH
EH13 0BW
Tel 031 441 4257

DESTROYERS ◯ £6·50
ZX TREK ◯ £6·50

TRANSFORM LTD.

ZX Business Software.

FOR SMALL BUSINESSES AND THE SELFEMPLOYED

Business Bank Account 1: this program enables you to make debits under 11 subheadings. Statements include totals of all sub-headings. **£8.75**
Business Bank Account 2: with 15 subheadings and standing orders. **£10.75**
Sales Day Book 1: for all your invoices, this program will enable you to prepare statements of outstanding invoices. Program will also calculate VAT. **£8.75**
Sales Day Book 2: with many extra facilities including totals of past 12 periods. **£10.75**
Sales Cash Book: for retailers program calculates VAT and denotes method of payment. **£8.75**
Purchase Day Book 1: keeps a complete record of all your purchases under 11 subheadings. The program will also calculate and deduct VAT. **£8.75**
Purchase Day Book 2: with many extra facilities including totals of past 12 periods. **£10.75**
Quarterly Analysis: quarterly totals from Bank Account, Purchase and Sales programs can be analysed with this program. **£4.75**

• All the programs have full search facilities •

Business Pack 1: incl. Bank Account 1, Sales 1, Purchase 1 and quarterly analysis programs **£25.00**
Business Pack 2: incl. all 4 programs **£30.00**

Please specify memory size when ordering for your ZX81 or ZX spectrum.

ALL PRICES include VAT post & packaging for details send SAE to

TRANSFORM LTD
41 Keats Ho Porchester Mead Beckenham, Kent.
Tel: 01-658 1661

J. K. GREYE ENTERPRISES LTD



... is a new company, from J.K. Greye, set up specifically to bring you High Quality/Low Cost games for your Sinclair ZX Spectrum.

THE ARCADIAN

4 Games plus Menu

for the 16/48k
SINCLAIR ZX SPECTRUM

only **£4.95** incl.

Includes

Invasion · Kamikaze
Minefield · UFO

Games as sold elsewhere for £5 + each, why pay more for less, when you can get all four for the price of one!

The **ARCADIAN**
includes games to suit all ages, from 5 to 105

INVASION: Our version of the Classic Arcade Game, surely one of the best around. Includes Full Colour High Res. Graphics, Sound and it's incredibly fast at the end.

KAMIKAZE: If you like Scramble, you'll love this. 16 levels (long ones at that), of tortuously twisting caverns, Missiles, Starmines (which move in between games, so it's never the same next time around), Bases, Fuel Dumps (watch you don't run out of fuel!), and two speeds (difficult and impossible). Definitely a game for those amongst you with a suicidal tendency, when playing games, because you can score even when you crash! (If you can make it past level 8, write and let us know, 'cause that's as far as we've managed!).

MINEFIELD: A totally new game, in which you have to lay mines in a forest. Sounds simple doesn't it? But, once you start, you can't stop and there lies the rub (or to be more exact the explosion!). Guaranteed to get your fingers in a twist!

UFO: Dodge the Asteriods, blast the Alien Craft and work off your aggressive instincts on the keyboard. Gets progressively more difficult the longer you last!

All of these for only £4.95, can you afford to miss out on this one!

Send your order to **J.K. GREYE ENTERPRISES LTD**
16 PARK STREET, BATH BA1 2TE.

Please send me....... copies of "**The ARCADIAN**" at **£4.95** each, to: Name..

Address..

.... Postcode..............

I enclose a cheque/P.O. for £..
made payable to **J.K. GREYE ENTERPRISES LTD.**

All Software sold subject to the condition that Hiring, Lending, Unauthorised Copying or Resale is Strictly Prohibited.

TRADE & EXPORT ENQUIRIES WELCOME

PROGRAMMERS! Do you think you can write brilliant games Software for the Spectrum?
If so, contact us and we'll market it for you. If you don't think your games are the best around, try the other Software Houses, because we will only sell the best!

COMPETITION-PRO JOYSTICK

• PRECISION GAME CONTROL!



Outstanding Features

- Self centring stick.
- Super strong nylon and steel construction, built to last.
- A total of 8 directions plus 2 large fire buttons.
- Arcade proven moulded leaf switches ensure incredible reliability.

For **ZX Spectrum** complete with self contained box interface which simply plugs into the Spectrum expansion port (with or without printer) **only £25.00** inc. VAT.

For **VIC 20, Atari 400** and **Atari 800 only £16.49** inc. VAT.

Full range of software available, details on request.

SOLE UK DISTRIBUTOR

KEMPSTON MICRO ELECTRONICS

180a Bedford Road, Kempston, Bedford MK42 8BL

I wish to order:

Quantity	Item	Price
	Post & Packing	£1.00
	Total (VAT inclusive)	

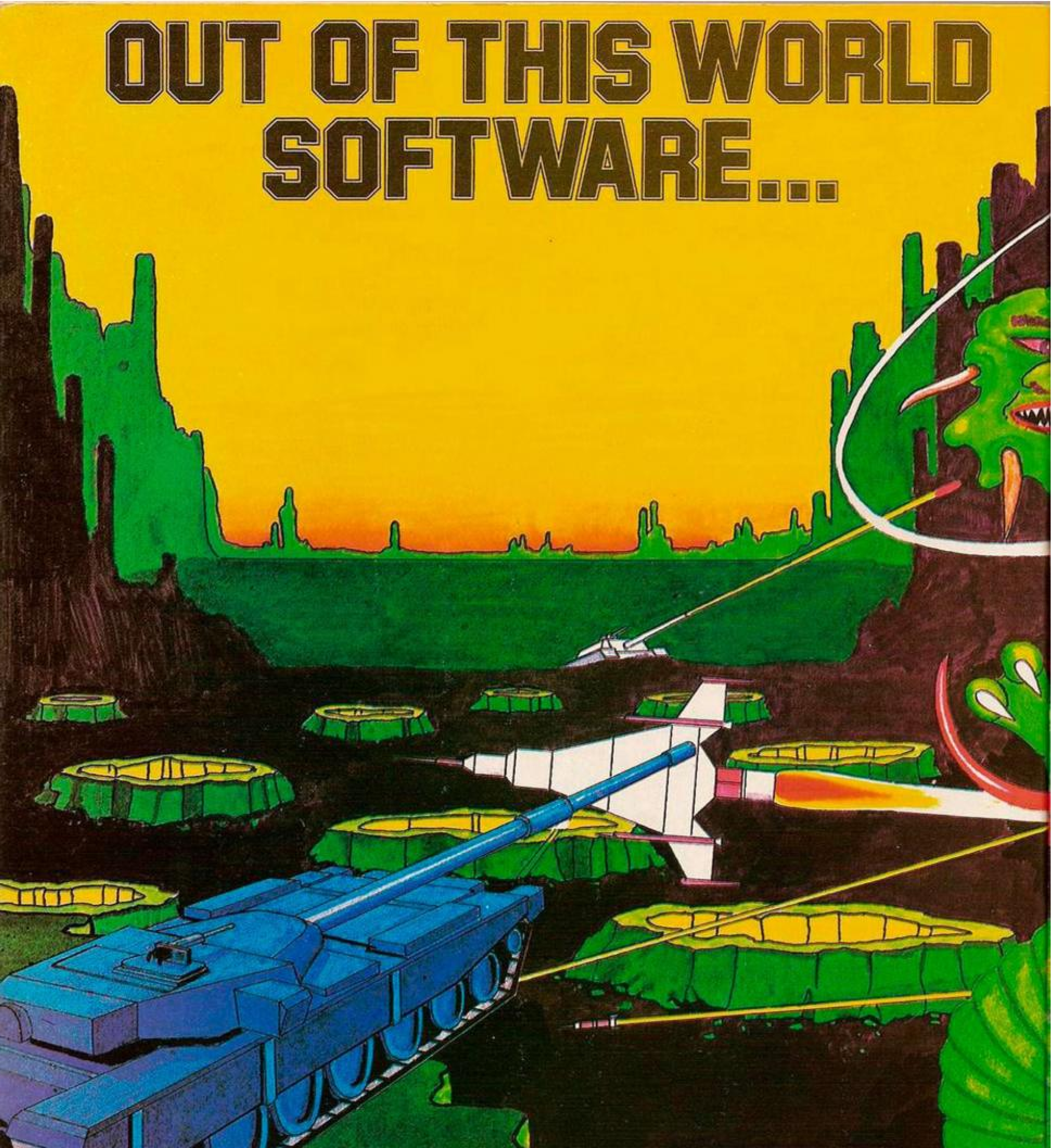
Cheques/Postal orders should be made payable to Kempston (Micro) Electronics

Name ____________________

Address ____________________

____

Post to Kempston (Micro) Electronics, Dept 180a Bedford Road, Kempston, Bedford MK42 8BL



PLEASE SEND ME .... @£ ....

PLEASE SEND ME .... @£ ....

PLEASE SEND ME .... @£ ....

PLEASE ADD ON 50p for P&P

I enclose cheque/P.O. payable to

DK Tronics total .... or debit my

Access/Barclaycard

NAME .... ADDRESS ....

....

SIGNATURE ....

CREDIT CARD SALES LINE
(0493) 602453 (24 hrs)
Quoting your Access or Barclaycard number
DK Tronics software is also available from all good software outlets.

3D TANX—Pit your wits against the enemy Tanx. This is a full feature game with fantastic 3D balistics. **ONLY £4.95**
3D SPAWN OF EVIL—Eliminate the spawn before it matures to full attack potentia The most spectacular 3D space game ever written for this 16K Spectrum. **ONLY £4.9**
CENTIPEDE—Shoot down the ever menacing Centipede before it shoots you. One the most addictive games for the Spectrum **ONLY £4.95**

For more information send S.A.E. for our full colour brochure.



ICTATOR—Can you survive as Dictator? A complex nd entertaining simulation adventure featuring easy peration and excellent use of graphics **ONLY £4.95**
IETEOROIDS—The best Spectrum version of this opular arcade game **ONLY £4.95**
OUND FX—Even the beginner can use this nstastic program to create and infinitely variable mount of machine code sounds **ONLY £4.95**
ISASSEMBLER—A fast machine code disassembler or use on the 48K and 16K Spectrum giving full olour output to the screen **ONLY £4.95**
XED (Toolkit)—A powerful editor for use on the 6K and 48K Spectrum. It creates several useful and me saving features **ONLY £6.95**

...from dk'tronics

dk'tronics

23 Sussex Road, Gorleston, Gt. Yarmouth, Norfolk.

THE MicroComputer SOFTWARE CLUB

FOR OWNERS OF VIC, ZX81, SPECTRUM, BBC, OR DRAGON MICROCOMPUTERS

Buying software for your computer is a gamble. Apart from the occasional review and, perhaps, a recommendation from a friend, you have precious little information upon which to base your purchasing decision.

Advertisements and clever packaging can make the the worst programs appear tremendous. It is not until you have 'gambled' your money that you discover how good they really are. Some are only slightly different to others you may already own; many are not as good as you would be entitled to expect; and others are just a complete waste of money. Of course, there are some excellent programs around, and many more appear month. Now there is a safe way of finding out about them.

- free membership -

THE MICROCOMPUTER SOFTWARE CLUB was started to make software purchasing easier, cheaper, and less risky. Membership is completely free of charge, as is the monthly Newsletter. Every month members receive full details on the best and latest programs available for their computer and, simply and confidently, are able to order any of the programs they choose at substantially less than normal prices.

— large savings — on top software

All programs are, at least, 10% cheaper than normal and, each month, the best of the most recent software is made available to members at 20% less than normal. Postage and packing is free on orders of two or more programs for delivery within the UK; ordering and payment are simple, and quality is guaranteed.

— no obligation —

Members are not obliged to buy a fixed number of programs from The Club. They buy what they want when they want. Whether it is one program in a year or one a month, they know that when they buy from THE MICROCOMPUTER SOFTWARE CLUB they are buying the best programs at the best prices.

– free Newsletter –

Our latest Newsletter offers programs from most leading suppliers - and from a few that, perhaps, you do not yet know. A program has to be good, very good, before it is recommended to members. It also has to be reliable and, even before the members' discount, it has to be good value for money. Subject coverage includes adventure, arcade, education, strategy games, household applications, family games, business, utilities and programming aids.

Remember, membership is completely free of charge and you are under no obligation to buy anything from The Club unless you really want to. If you own or use a ZX81(16K), Spectrum(16K or 48K), BBC (A or B), Dragon 32, or VIC (expanded or unexpanded), you should join THE CLUB.

JOIN TODAY

THE MICROCOMPUTER SOFTWARE CLUB
P.O.Box 166, Oxford, OX2 9BJ, England.

Free membership application

Please accept my application and enrol me as a member of The Microcomputer Software Club. I understand that membership is free of charge.

As a member I will receive the Club Newsletter free of charge and will be entitled to benefit from any savings offered to members on selected programs for microcomputers. I may cancel my membership at any time.

When completed, return form to:-

THE MICROCOMPUTER SOFTWARE CLUB
P.O.Box 166, Oxford, OX2 9BJ, England.

NAME

ADDRESS

CITY

POSTCODE AGE (If under 18)

COMPUTER MODEL COMPUTER RAM

SIGNATURE

A VARIABLE is a named memory area inside the Vic which can store varying data. This data can be in the form of numbers or characters. If you can remember algebra at school it typically looked like

x + 2 = y

where x and y are variables. Obviously the value of y will vary as the value of x varies. There are two types of numeric variables used by the Vic — integer and floating point, which is sometimes called real.

Integers are whole numbers with no decimal point and the Vic can only deal with them in the range -32768 to +32767. The Vic will assume that numbers are positive unless you tell it otherwise. Examples of integers are:

1, 100, -32000, 999

Floating-point numbers can have a decimal point and cover a much wider range than integers. Floating-point numbers can also be expressed as a mantissa with an exponent.

VIC-20



Savour Clive Finnis' recipe for slimmer and faster programming with this first course in Vic variables.

VARIABLES: FIRST COURSE ON A PLATE

Simply, this means that the number 1234.5678 can be expressed as a mantissa of 1.2345678 and an exponent of 3, where the exponent means "times 10 to the power of 3", or in this case 1,000. This would be entered into the Vic as:

1.2345678E3

This might seem an unnecessary complication but in fact it makes the entry of very large and very small numbers easier.

For example the number 1,000,000,000.0 in mantissa and exponent form is 1E9 and the number .0000123 will be 1.23E-5.

A negative exponent can be thought of as "move the decimal point to the right", whereas a positive exponent means "move the decimal point to the left". On these two examples we moved the decimal point nine places to the left and ended up with an exponent E9, and in the second case we moved it five places to the right and had an exponent of E-5.

The range covered by the Vic is from ±1.70141183E+38 to ±1.93873588E-39, and the Vic works to nine digits of accuracy. Try some numbers outside this range and see what the Vic makes of them.

But how does the Vic expect you to define variables? What is the syntax for describing a variable? The computer only acts on one, two or three significant characters of the variable name — although variables can be much longer. The first character must be alphabetical. The simplest variable names will be just one alphabetical character — for example, A

In reality the Vic sees this as two characters, one alphabetical, the other a "nothing" character, that is ASCII 0 or null. Try the following:

```
PRINT CHR$(65)
```

You get the letter A — correct? Now try

```
PRINT CHR$(65)CHR$(66)
```

You get AB. Let us, introduce the ASCII 0 or null character in the middle to see what it does. Type

```
PRINT CHR$(65)CHR$(0)CHR$(66)
```

The printout reads AB again — in other words the ASCII null is completely ignored. So when we define our variable names as A, I or X the Vic stores A0, I0, X0.

If you decide to use a second character this can be alphabetical or numeric — that is A through to Z or 0 through to 9, so that AA, A9, XA, X1 are all valid names.

Our third significant character can only be $ or %. These characters define the type of variable that the one or two preceding significant characters represent.

Any variable followed by the % sign means that this is an integer variable. Any variable followed by the $ sign is defined as a string variable. Any variable not followed by % or $ is by default a real variable. Examples of valid variable names are

A	AA	A1	Z9	for real
1A%	AA%	A1%	Z9%	for integer
A$	AA$	A1$	Z9$	for string

Note that you can use, say, A, A% and A$ in one program and the Vic will quite happily differentiate between them — it sees them as three quite separate variables.

Where possible try to pick variable names which mean something to you and relative to the job that they are performing. There are traps for the unwary, through. Say you are using the variable CO. There will be a hidden syntax error in the following apparently good line:

```
FORI=100TOCOSTEP-1
```

The problem? Vic sees the CO of the variable and the S of Step as Cos which is of course a Basic function.

The cure? Put a space between CO and S or find another variable name. What is wrong with C on its own? It will save you two bytes in this instance alone.

In some cases it might be more convenient to use whole words as variable names instead of just one or two characters. For example, if you are writing a program to help sort out your home finances, variables such as Interest, Balance, Debit mean far more when working through your listing than, say, In, Ba and De.

You do not often get something for nothing though and this is no exception. You gain in program clarity — you lose in using more memory to do the same job. Every time your program uses, say, the variable name Interest, it needs eight bytes of memory to store it — one byte for every character. So the difference between using In and Interest is six bytes for each time it is used.

Integer variables are quite literally a waste of time and effort. As you will see later all numeric variables — forget about strings for the moment — are stored as floating-point numbers. Thus when we ask the Vic to perform integer arithmetic as follows:

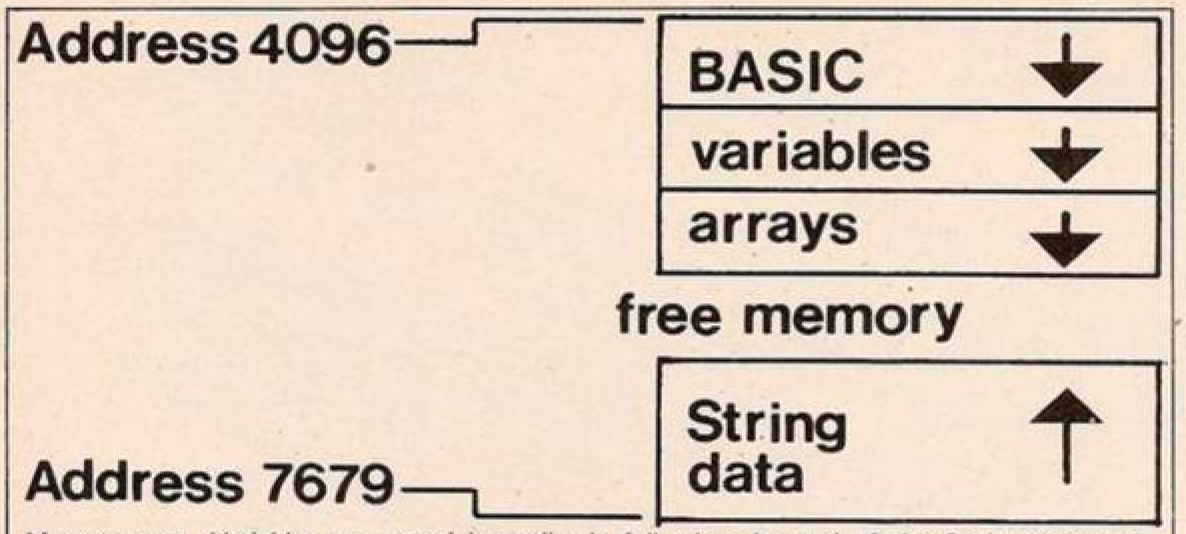
```
X%=Y%+Z%
```

it first takes the floating-point contents of Y% and converts them to integer, then it takes the floating-point contents of Z% and converts them to integer, adds these two integers, then converts from integer to floating point and stores the contents in X%. Not only are you wasting time while the processor performs unnecessary tasks, but the % character uses up one extra byte of memory every time it occurs in the program. Tails you lose, heads you cannot win.

This does not apply to integer arrays. Significant memory saving can be achieved by defining an array as an integer instead of real.

We saw earlier that you cannot use Basic

(continued on next page)



Memory map. Variables are stored immediately following the end of the Basic program in memory, and they are immediately followed by the arrays.

(continued from previous page).

command words or functions as variable names — for example Cos, Sin, New, Print would all be thrown out as syntax errors if you tried to use them as variable names. There are three other reserved words which you cannot use as general-purpose variable names because they are already used by the Vic for specific variables.

ST — short for Status — is used to monitor input-output functions to the screen, cassette, keyboard or serial bus.

TI is used for the real-time clock. This is updated every 0.016 seconds by an interrupt routine.

TI$ is a string variable of six characters length and it will return a real time in the format HHMMSS. It may be initialised — set to zero — easily by TI$="000000".

So now you know something about real and integer variables, but what is the string variable that keeps popping up?

String variables are used to store not numeric information, like real and integer numbers, but any of the 256 ASCII characters available on the Vic. Thus whereas the variable A may contain 1.2345, the variable A$ may contain the word computer. String variables are written to — filled up — in the following manner:

```
A$="COMPUTER"
```

The contents must be framed by the quotation marks Shift and 2 on your keyboard.

String variables are not restricted to storing the letters A through to Z, but can store Vic graphics and control characters as well. For example try the following routine:-

```
10 LET A$="(clear screen)"
20 PRINT A$
```

where (clear screen) is the Shift and Clear Home.

If we Run this routine the screen will clear just as if we had typed

```
PRINT"(clear screen)"
```

Note that the Let in line 10 is optional in Vic Basic. Line 10 could have been written as

```
10A$="(clear screen)"
```

String variables can be up to 255 characters long. This, at first, seems rather difficult to achieve as the maximum number of characters that the Vic will accept for one line of Basic is 88, and this must include the line number itself. We can achieve long string variables — if we really want to — by the process of concatenation of variables. This is really just a complicated way of saying adding together of string variables. For example, the program

```
10 A$="YOUR"
20 B$="COMPUTER"
30 C$=A$+B$
40 PRINTC$
```

produces the result

```
YOURCOMPUTER
```

C$ has effectively taken the contents of A$ (Your) and has joined on the contents of B$ (Computer) to form the longer string.

Using the CHR$ command other characters may be added to the string. For example to get a slightly better format to the result we can amend line 30 to read:

```
30 C$=A$+CHR$(32)+B$
```

which will give us

```
YOUR COMPUTER
```

Character 32 is "space" in the Vic. Another way of achieving the same result here would be to use the construction

```
30 C$=A$+" "+B$
```

Try different combinations yourself. Use the cursor keys and colour characters inside string variables and see what results you get. Try to make a string variable 255 characters long by using concatenation and discover the error message that the Vic will print if you exceed this number.

It is also possible to perform comparisons between string variables by using the following format

```
IF A$=B$ THEN etc.
```

Of course when it comes to operating on variables there are far more operators available for the numeric variables. One word of warning, though: if you want, say, the square of variable A, it might be tempting to use exponentiation of the form

```
B=A↑2
```

However, whereas this will give you the correct result, it is a very slow operation in Basic and you would be better advised to use the less impressive but faster contruct

```
B=A*A
```

So now we have a grasp of the different types of Vic variable and how to use them. But how does the Vic store these variables? To answer that we must first look at the memory map.

In an unexpanded Vic, user memory starts at address 4096 and finishes at address 7679. Addresses 7680 to 8191 are the screen area and thus the total RAM available is 4K of which 0.5K is for the screen leaving the infamous 3.5K for you. To be fair, the reason why RAM is limited on the Vic is because RAM chips were expensive when Commodore designed the Vic a few years ago. The cost of the 4K chips used in the Vic was probably more than 64K chips cost today because of phenomenal advances in RAM technology.

Anyway, back to memory maps. Variables are stored immediately following the end of the Basic program in memory, and they are immediately followed by the arrays. This variable storage area stores both the names and contents of numeric variables, but stores the name only of string variables along with an address of where the actual contents of that variable can be found. The contents or string data are stored downwards from address 7679, that is, top of memory. Thus free memory is actually the gap between string data moving downwards from top of memory and the end of arrays moving upwards.

As the boundaries between these different areas will move as the Basic program is edited, or string variables are changed, or whatever, the Vic must keep a careful note of where these boundaries are. The addresses of these boundaries are stored in specific memory locations in standard low-byte/high-byte order. I know some beginners get confused by these terms: put simply, the Vic can only store eight bits of information in each memory address because it is an eight-bit machine. Eight bits give you a total range of from 0 to 255 only, but the Vic can address a total of 65,535 addresses. Thus to get this range it is generally necessary to use two bytes for each address stored as low byte that is, least significant and high byte — the most significant. The actual address is low byte +256 (high byte). If you work out 255+256×255 you get 65,535 — thus we can address the whole Vic range using this format.

The locations which we are interested in are as follows:

	Low byte	High byte	Address
Start of Basic on unexpanded Vic	43 1	44 16=	4097
Start of variables	45	46	
Start of arrays	47	48	
End of arrays	49	50	
End of strings moving downwards	51	52	
Top of memory on unexpanded Vic	55 0	56 30=	7680

Thus we know that variables are stored in the area which starts at the address pointed to by locations 45 and 46 and finishes at the address pointed to by locations 47 and 48.

The Vic stores all variables regardless of whether they are real, integer or string in a similar way in this area, namely two bytes for name, five bytes for contents — or the address of where the contents are stored in the case of strings. But if only two bytes are used for the variable name, how does the Vic store the three significant characters that it requires to define each variable? It does this by adding 128 to the first or second character depending on the type of variable. For example, the real — floating point — variable AA will be stored as 65 65 where 65 is the ASCII code for A. The variable AA$ will be stored as 65 193 — that is 65 (65+128). The variable AA% will be stored as 193 193.

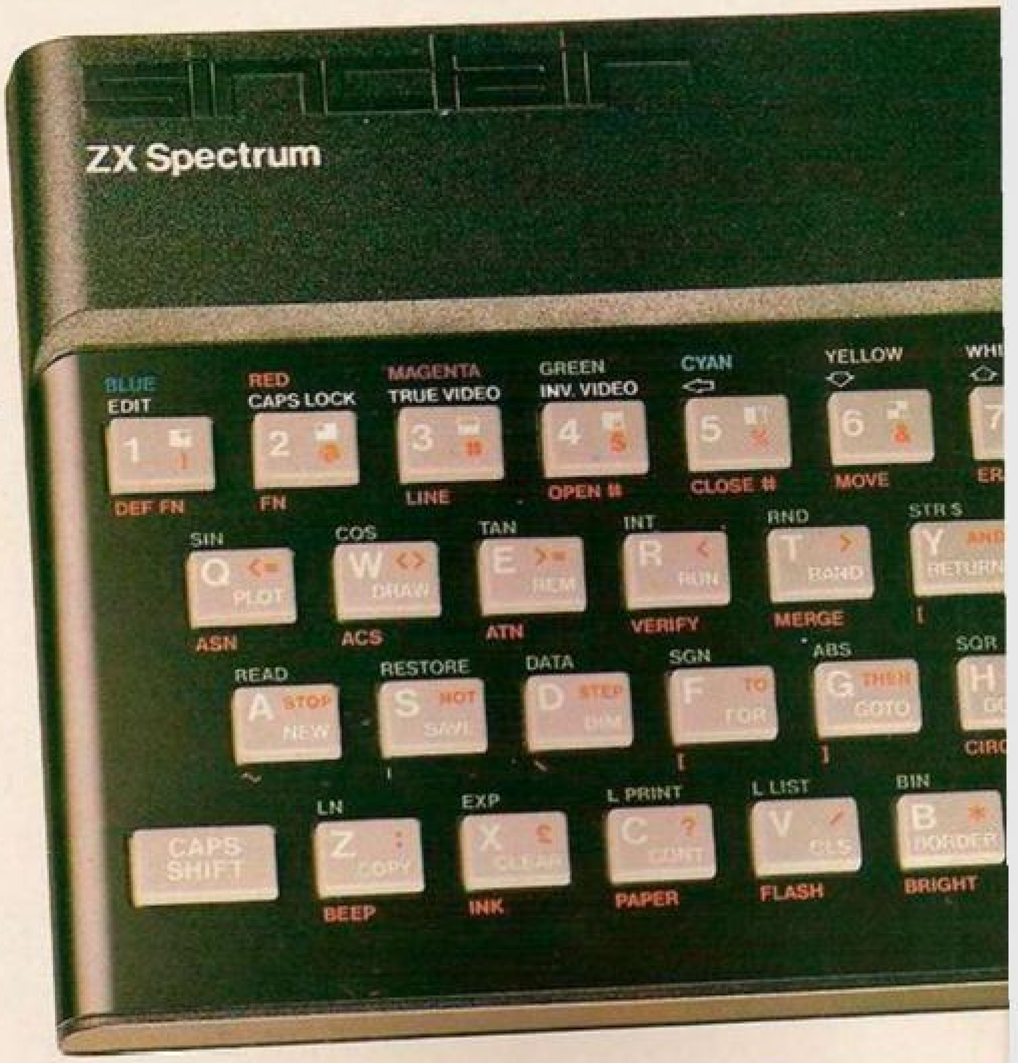
(continued on page 101)


sinclair
ZX Spectrum

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer–available now–is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232/network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour–8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound–BEEP command with variable pitch and duration.
- Massive RAM–16K or 48K.
- Full-size moving-key keyboard–all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution–256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set–with upper- and lower-case characters.
- Teletext-compatible–user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE–16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC–incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um

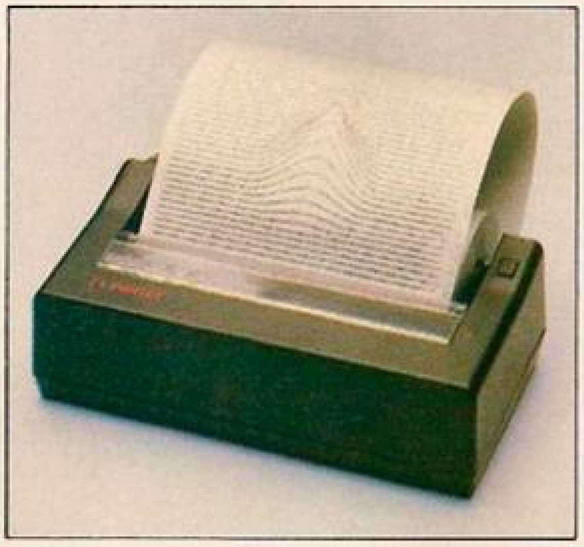


The ZX Printer–available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set–including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive–coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.



ZX Spectrum software on cassettes–available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

**Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.**

How to order your ZX Spectrum

BY PHONE–Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST–use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY–please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt–and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum–16K RAM version	100	125.00	
	Sinclair ZX Spectrum–48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £______

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

YOC 903

FREEPOST–no stamp needed. Prices apply to UK only. Export prices on application.

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU/ memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/ speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive-or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, −, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

sinclair
ZX Spectrum

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

Program 1. The variable lister.

```
63000 PRINT"J":Z8=PEEK(45)+256*PEEK(46)
63001 Z9=0:IFZ8>=PEEK(47)+256*PEEK(48)THENEND
63002 IFPEEK(Z8)>127THENPRINTCHR$(PEEK(Z8)-128);:Z9=37:GOTO63004
63003 PRINTCHR$(PEEK(Z8));
63004 Z8=Z8+1:IFPEEK(Z8)<128THENPRINTCHR$(PEEK(Z8));:GOTO63006
63005 PRINTCHR$(PEEK(Z8)-128);:IFZ9=0THENZ9=36
63006 PRINTCHR$(Z9),:Z8=Z8+6:GOTO63001
```

(continued from page 96)

The Vic places variables into the variable storage area as and when it encounters them in a Basic program. In the following program, A would be stored first, then B, then C$.

10A = 1:B = 10:C$ = "C"

Program 1 is a utility which will list all the variables' names used in a Basic program. It uses two variables itself, Z8 and Z9, and takes up about 230 bytes.

Line 63000 clears the screen and sets Z8 to the address of the start of variables.

Line 63001 sets 9 to zero. Thus if we subsequently

PRINTCHR$(Z9)

it will print the ASCII null mentioned earlier. This also checks whether Z8 is equal to or greater than the address of the end of variables. This step is obviously redundant for the first pass through the program.

Line 63002 checks whether the character stored at address Z8 is greater than 127 and if it is, subtracts 128 to give us a printable character in the range A to Z. Z9 is then set to 37 which means a subsequent

PRINTCHR$(Z9)

will give a % character — that is, we have detected an integer variable as the first character is greater than 127.

Line 63003 prints the character if it was originally less than 127.

Line 63004 increments Z8 by 1 so that we are now looking at the second character of our variable name and a similar process to that in line 63002 is performed.

Line 63005 sets Z9 to 36 — the character code for $ — if it has not already been set to the % code.

Line 63006 prints Z9 which can now be 0, 36($) or 37(%), and then increments Z8 by 6 to pick up the first character of the next variable name. The program then loops back to line 63001 to continue the process.

How do you use this utility? It needs to be in memory with the main Basic program whose variables you want to list. More of how to get it in later. You must then Run your program and when it ends type

GOTO63000

This will start the utility, the screen will clear and the variables encountered in the Basic program will be listed. Ignore Z8 and Z9 which are listed at the end — they belong to the utility itself. Do not type Run63000 or all you will get is Z8 and Z9 on their own. This is because Run automatically does a Clr which clears the variable storage area.

If your main Basic program does not end but, say, continuously loops, press Run/Stop and Restore keys, then type

GOTO63000

The variables used will still be in the variable storage area. Remember, though, that they are placed there only as and when encountered by your Basic program, so try to ensure that it is run for long enough, or all possible subroutines are entered before pressing the Run/Stop, Restore keys or some variables may be left off your list.

Now how do we get the utility into memory? Well, one way is to Load your main program from cassette and then to type in the utility from the listing. Ensure that you do not already use lines 63000 and 63006 inclusive, of course, or you will overwrite them. This is obviously tedious and prone to errors. You cannot Load the utility from cassette as this automatically clears memory first and would thus delete your main program.

What is needed is the ability to merge or append programs — but this facility is not available on the Vic — or is it?

The following procedure was devised by Jim Butterfield — a Commodore Vic supremo. The trick is to save the utility on to cassette not as a standard binary file but as an ASCII data file and then to fool the Vic into accepting keyboard entry from the cassette.

Here is the procedure — it is a little complicated but mighty handy in lots of cases. First type in the utility from the listing. Save in the normal way typing

SAVE "VARIABLES"

This will give you a normal binary file as a back up in case anything goes wrong. Now type

OPEN1,1,1,"VARIABLES(ASCII)":CMD1:LIST

Press Record and Play on the tape cassette when asked to do so.

When the tape stops type

PRINT# 1: CLOSE1

You now have the utility saved as an ASCII file. What we did here was to Open the cassette for a Write operation; set the Vic output from the screen to the cassette; and then listed the program not to the screen but direct on to the cassette. We then closed the file and returned everything to normal.

Now to merge this with your Basic program which is already in memory. Firstly, make sure that you rewind the tape to the beginning of the utility ASCII file. Then type

POKE19,1:OPEN1

and press Return. Press Play on tape and the cassette will search for the file, finally reporting:

FOUND VARIABLES (ASCII)

Clear the screen and type exactly three cursor downs so that you are now on line four. Type ?"(home)":POKE198,1:POKE631,13:POKE153,1 and press Return. Note that (home) means the Clr Home key.

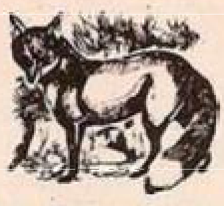
The motor will whirr into life and after a short time an error message will display on the screen. Ignore it.

If you now List you will find the utility tucked on to the end of your Basic program and you can Run and Goto 63000 as previously described.

This merging technique is also very useful for adding your favourite subroutines to a program already in memory.

Different programming techniques are generally required if you are trying to save space or trying to speed up a program. Unfortunately it is sometimes difficult to do both at once. If you are trying to save space, use single characters for variable names and minimise the number of variables that you use. Remember each new variable needs seven bytes in the variable storage area, and that string variables also need space in the string data area to store their text. To speed up a program you need to ensure that a specific variable can be found quickly by the Basic interpreter. You remember how Basic allocates variables into the variable storage area as and when it encounters them in the Basic program? Every time the Basic interpreter encounters a variable, it jumps to the variable storage area and sequentially scans along until it finds that variable name. Obviously, if that variable is first in the list, it finds it faster than if it is the last in the list. Thus to speed up the process we need to ensure that speed-critical variables, or the most commonly-used variables, are at the front of the list. We can do this by assigning them to dummy values in the first line of our Basic program.

If you are using a constant value in several places in a program it will speed up operation if you assign a variable name to it. For example if you are using the constant 32897.123 a lot, this uses up nine bytes every time it occurs. It also slows down the operation as Basic has to read in all nine characters and convert them to a floating-point number for internal use. An initial assignment of A = 32897.123 will not only save you memory but time as well. ■



FOX ELECTRONICS

NEW!

Presents Products:

For the Spectrum, The VIC-20, The Jupiter Ace and the ZX-81

The Fox **Spectrum Upgrade** Kit (for issue 2 machines only) takes your machine to 48K, no soldering required and full instructions supplied.
Unbeatable value at £24.00

Spectrum Keyboard — A 42 key full travel keyboard which ZX printed circuit board simply screws into. (No soldering required)



£29.95 + £2.50 P&P.

Improve your games with the Spectrum **Joystick.** Professionally built from strong nylon and steel. A must for all games lovers. ONLY **£25.00** + £1.00 P&P.

New Sounds for your Spectrum with the *New* programmable sound generator. **£19.95** + 50p P&P. or inexpensively enhance existing sounds with a sound expansion for only £6.95 + 50p P&P.

Or let your Spectrum do the talking with the **Chatterbox** phonetic synthesis, unlimited vocabulary complete with speaker/-amplifier and housed in a smart black box. Also for **ZX81. Both at £56.00** incl. P&P.

New from FOX the **Vixen RAM Cartridge** for the VIC 20. Switchable between 16K or 8K + 3K gives you the option of full 16K RAM or 8K and 3K RAM in one pack. Simply plugs into rear expansion port no re-addressing of existing basic programs needed only **£39.95** incl. P&P.



Let your VIC 20 talk to you with the **New Chatterbox** speech synthesizer with an infinite vocabulary of spoken words. Fully programmable and simply plugs into VIC or Motherboard. Includes a series of software routine in Eprom to facilitate the programming. **£57.00** incl. P&P.

Coming shortly from FOX

THE TANDEM
Expandable expansion system, gives 4 expansion slots for VIC 20 cartridges. Custom designed case, plugs directly into computer. Further expanded by using Tandem system ROM socket. No extra power supply needed. **£33.00**

THE PACER
Uniquely expandable 16K RAM pack for the **Jupiter Ace.** Similar concept to ZX Panda. For more power to **Faster Forth** you **need** a **Pacer.** 16K expandable RAM £29.95 16K Module £19.95 incl.

Improve your Memory with the ZX Panda. The **uniquely** expandable 16K RAM pack. Simply expanded to 32K by insertion of a plug in module. Specially designed to eliminate wobble, and complete with LED power indication



16K expandable RAM pack	£24.50 incl. P&P.
16K expansion module	£19.95 incl. P&P.
or 32K complete for	£40.00 incl. P&P.

or go for the **Big Big** pack 64K only £50.00

ZX81 Keyboard (identical to Spectrum keyboard opposite again with ZX81 PCB fitting inside, again without soldering. A great buy at only **£29.95** + £2.50 P&P.

ZX81 Keyboard No 2.
Alternatively, go for the stylish and efficient, pushbutton, precision moulded (ABS as per your ZX81) 3 coloured keyboard at an incredibly low price of Unit adheres direct to ZX keyboard. No soldering required. **£10.00** incl. P&P.

Coming Shortly
The Spectrum Echo. Volume and tone control. Load and Save without switching leads. Looks good, sounds good. **£23.50** incl. P&P.

Send now to FOX Electronics 141 Abbey Road, Popley 4. Basingstoke, Hants Catalogue available. Send SAE. All products guaranteed 1 yr. Overseas customers add a further £1.50 P&P to all items. Delivery 10-14 days.

Self Adhesive Cassette Labels

- ★ ON ROLLS OR SHEETS
- ★ IDEAL FOR USE IN TYPEWRITERS
- ★ A BOON TO SOFTWARE PRODUCERS
- ★ CAN BE PRINTED WITH CLUB OR COMPANY LOGO OR SYMBOL

CASSETTE LABELS ON SHEETS (15 Labels per sheet)	CASSETTE LABELS ON ROLLS (Complete with tractor feed perforations to allow use in most computer printers)
100 Labels £3.50 200 Labels £6.00 300 Labels £8.25 400 Labels £10.00 500 Labels £12.00	Square or round ended centre hole Minimum order 500 labels 500 Labels £11.00 1000 Labels £20.00 2000 Labels £35.00

All Prices include VAT and postage/packing
Excellent discounts for large quantities
Please send stamp for printing price lists and sample labels
NEW FOR 1983 - Sampler pack of different types of computer label - £20

Industrial Process

Unit A4
Smeed-Dean Centre
Eurolink Ind. Estate
Sittingbourne
Kent ME10 3RN
Sittingbourne (0795) 28425 (24 Hrs.)

SPECTRUM SPECTACULAR £4.95

DRAGON EXTRAVAGANZA £4.95

Two new books by Roger Valentine. Each containing a mammoth 50 programs (for the Sinclair Spectrum and Dragon 32 respectively).

From the publishers of:

WHAT CAN I DO WITH 1K? £4.95

WHAT CAN I DO WITH 16K? £4.95

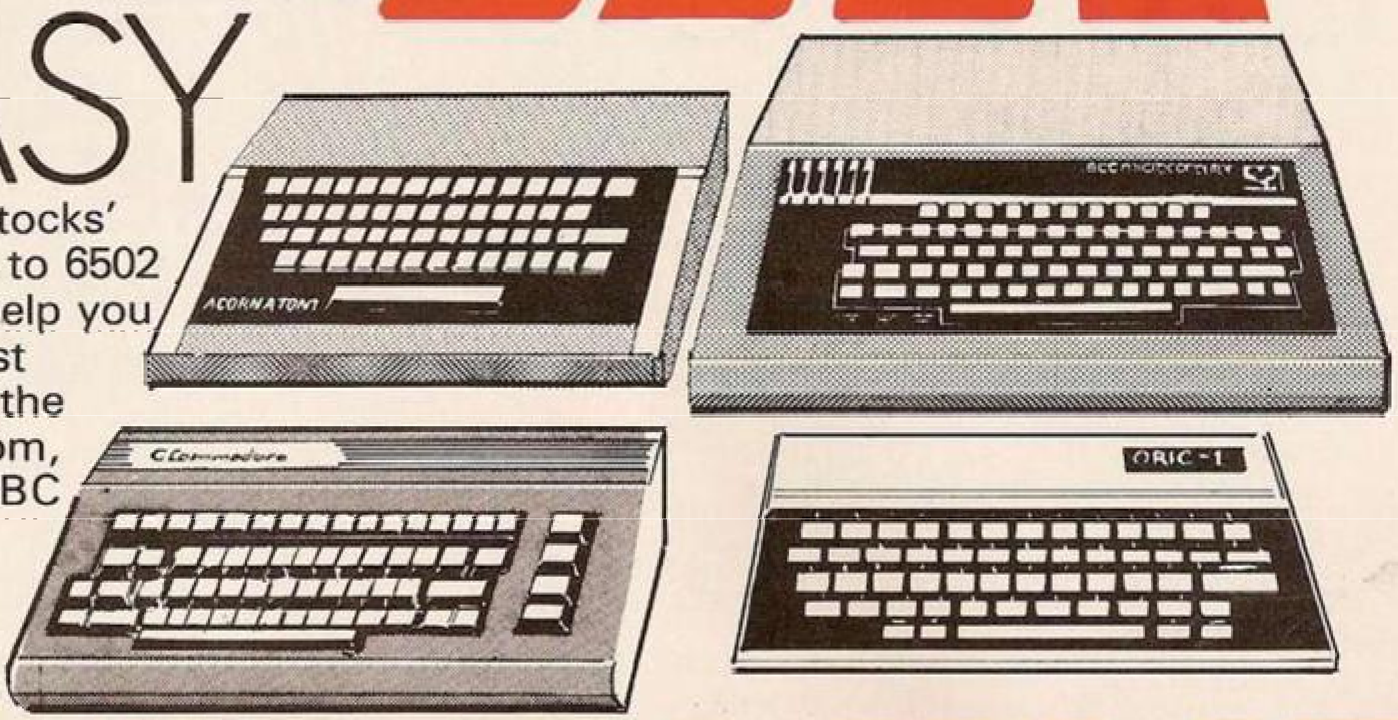
The two best program books for the Sinclair ZX81. Available from your bookshop, or

V&H COMPUTEER SERVICES
182c Kingston Road, Staines, Middx.
Tel: Staines 58041

BUSINESS USERS PLEASE NOTE: OUR **PAYROLL** PROGRAM IS NOW AVAILABLE FOR: **ZX81, SPECTRUM, PET, BBC, KONTRON** AND SOON **DRAGON PLEASE WRITE FOR DETAILS OR SEND £2.00 FOR COMPREHENSIVE MANUAL (SINCLAIR VERSIONS ONLY)**

MADE 6502 EASY

Darryl Mattocks' new guide to 6502 code will help you to write fast games for the Vic-20, Atom, Oric and BBC Micro.



MACHINE CODE

THIS ARTICLE is aimed at those of you who would normally read the words machine code, scream, and turn the page quickly. If you have done this in the past, now is the time to change. Did you realise that Basic itself is a machine-code program, and that every instruction such as Print, Let and Poke is converted into machine code, and then run as machine-code subroutines? This tends to make Basic very slow — a machine-code program is in the order of 100 times faster than its Basic equivalent.

As in Basic, machine code is made up of a series of instructions which are executed sequentially — one after the other — starting from the one in the lowest memory location and working up through the memory. As in Basic we have instructions allowing us to jump to a new location — Goto — execute a subroutine and return to the instruction following the subroutine call — Gosub and Return — add number, subtract, conditional jumps — If-Then-Goto — and so on. The only trouble with machine code is that these instructions are set out differently.

A command in machine code is called a mnemonic and the thing that this mnemonic manipulates is called an operand. This is illustrated in figure 1, a short segment of machine code.

Unfortunately, these mnemonics and operands cannot be typed directly into the computer. To speed things up, each mnemonic is represented by a numerical code — varying from 0 to 255. These special codes are called operation codes — op-codes for short — and it is these op-codes that the computer can understand and act on.

In figure 1 then, A9 represents the LDA # command, 85 the STA command and 60 the RTS. Using these op-codes and operands then, we can reduce any program to a series of numbers.

For variables in machine code we have registers. A register is similar to a variable in Basic — that is, it can be set to contain a particular value which can then be added to or subtracted from in a similar pattern to the variables in Basic.

Now here is the catch. We have only five registers, and of those, only three are available to play with. If that is not bad enough, they can only contain integer values from 0-255 inclusive. It may look grim, but let us assess exactly what we have available.

Register symbol	Name
A	Accumulator
X	X register
Y	Y register
SP (or S)	Stack pointer
S (or P)	Status register

The A register is the most used, and most important register of the five. The X register is used mainly as a variable or offset. The Y register is used mainly as a variable or offset. The SP and S registers are pretty tricky and win a separate section of their own later on; but basically the SP shows current position on stack, and S is the basis of conditioned jumps, etc.

Now let us try a simple machine-code program for adding up the two numbers stored in memory locations — from now on referred to as bytes 0 and 1 and storing the result in the second byte — byte 2. The equivalent Basic program to do this would be

POKE 2, PEEK (0) + PEEK (1)

In machine-code this looks like this:

Op-code	Operand	Mnemonic	Comment
18		CLC	Clear the carry bit
A5	00	LDA 0	Load the Accumulator from byte 0
65	01	ADC 1	Add contents of byte 1
85	02	STA 2	Store the Accumulator in byte 2
60		RTS	Return to Basic

(continued on page 107)

For the best hardware, the best software.

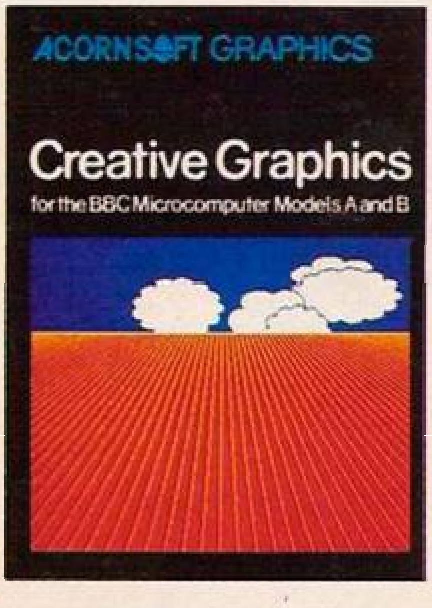
The BBC Microcomputer system is generally regarded to be the best micro in its price range you can lay your hands on. So, if you're thinking of buying one or already own one, you'll want to know about the software that's been specially designed for it.

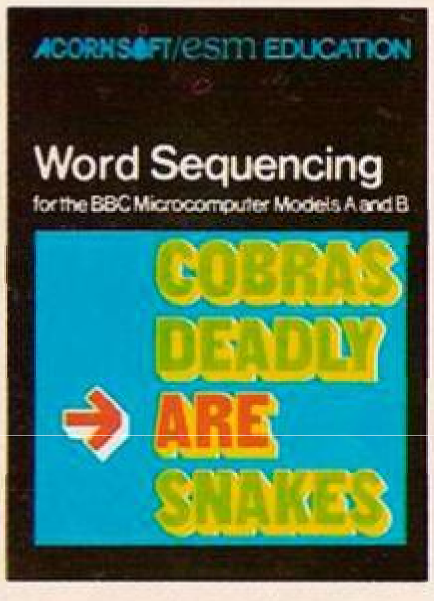
Not surprisingly, it's made by Acornsoft, the software division of Acorn Computers Ltd., who designed and built the BBC Microcomputer. So naturally you can expect the highest quality software with the built-in ingenuity to fully exploit the BBC Micro's potential.

Further education for everyone.

Creative Graphics, which includes the book 'Creative Graphics on the BBC Microcomputer' (price £17.45), provides 36 programs on cassette producing a spectacular range of pictures and patterns in full colour, including animated pictures, recursively-defined curves and three dimensional shapes.

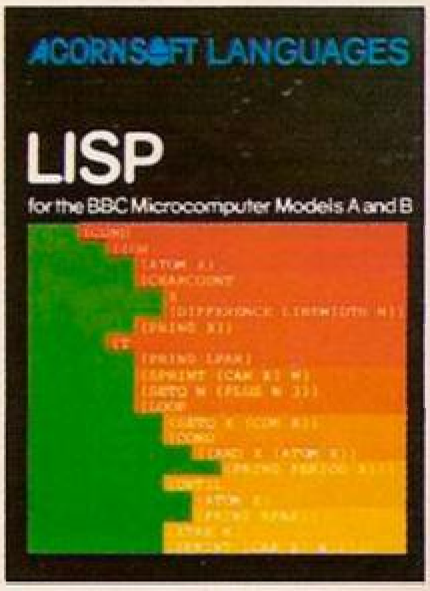
Word Sequencing (price £11.90) contains three word sequencing programs on cassette. Each program presents a series of jumbled words which must be arranged on screen to form either a proverb, nursery rhyme title or a sensible sentence.

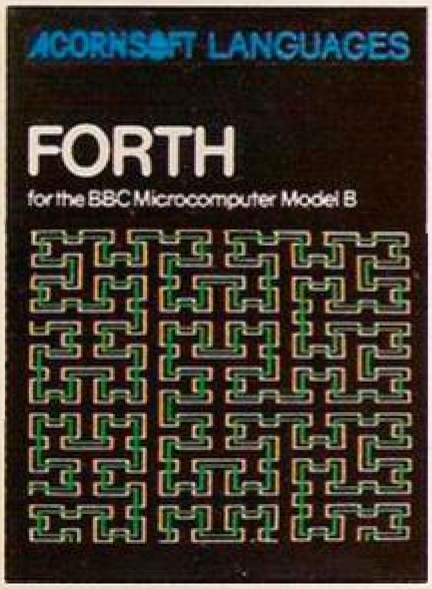




Learn more languages.

LISP (price £24.35) is the fundamental language of artificial intelligence research.





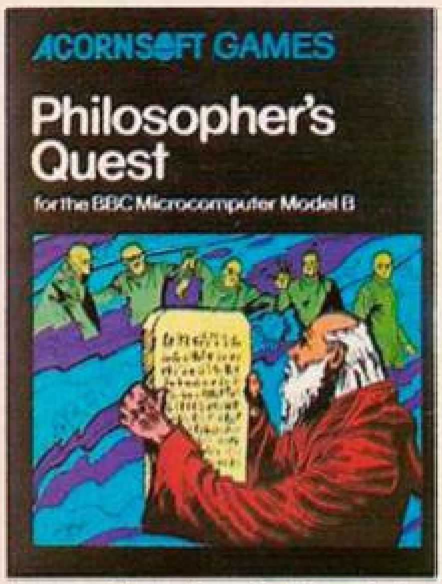
It consists of 5.5K of machine code interpreter, plus 3K of initialised LISP work-space containing utilities and constants. It comes complete with a book that introduces you to programming in LISP, as well as some fascinating applications.

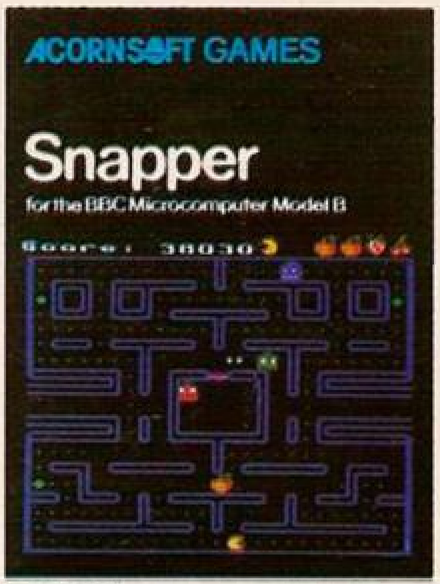
FORTH (price £24.35) is a complete implementation of the FORTH language to the 1979 standard specification for the BBC Microcomputer Model B. This much acclaimed programming language is also accompanied by a specially written book explaining all you need to know.

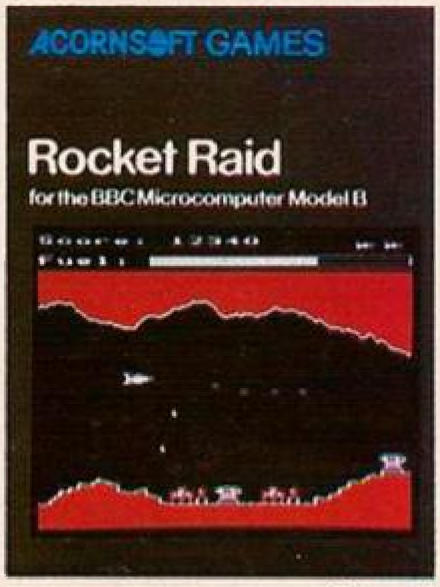
Mind-boggling games.

Philosopher's Quest (price £9.95) is an advanced adventure in which you tell the computer what you want to do and it









describes back in plain English your progress through a fascinating world of fiendish puzzles to be solved.

Snapper (price £9.95) is a colourful game where you guide your 'snapper' through the maze, eating dots and fruit and avoiding the creatures that chase you. Complete with full sound effects, score and a ladder of high scores.

Rocket Raid (price £9.95) sends you on a mission to raid a heavily guarded Martian fuel depot. You must fly your rocket over mountains and through caverns, avoiding enemy missiles and dodging convoys of deadly fizzers.

Increase your business acumen.

Desk Diary (price £9.95) is an indispensable program that can hold a file of several hundred names, addresses and telephone numbers.

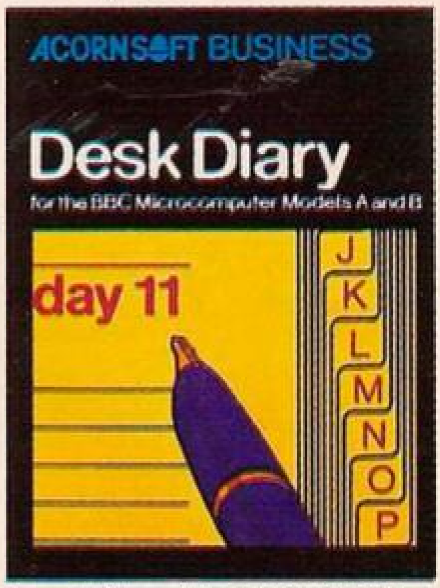
And View, a program that enables your machine, together with a printer, to operate as a fully operational word processor. (The program is in ROM, but can easily be fitted to most BBC Micros by your local dealer.) You can find out more by sending for our free catalogue.

How to get Acornsoft programs.

If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy the cassettes directly by sending off the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Also use this form if you would like to receive the current free Acornsoft catalogue.

Please allow 28 days for delivery.



☎ Credit Card Holders. Ring 01-200 0200.

To: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.
Please send me the following:–

PROGRAM	PRICE	QUANTITY	TOTAL	(Code Acornsoft use only)
Creative Graphics	£17.45			(SBX01/SBD01)
Word Sequencing	£11.90			(SBE06)
LISP	£24.35			(SBL02/SBD04)
FORTH	£24.35			SBL01/SBD03)
Philosphers Quest	£9.95			(SBG01)
Snapper	£9.95			(SBG04)
Rocket Raid	£9.95			(SBG05)
Desk Diary	£9.95			(SBB01)

TOTAL ______

I enclose PO/cheque payable to Acornsoft Ltd. Or charge my credit card.

Card Number ______
Amex/Diners/Visa/Access (Delete)

Please send me the Acornsoft brochure. ☐

Name ______

Address ______

______ Postcode ______

Signature ______ YC3

Registered No. 1524763 VAT No. 215 8123 85



ACORNSOFT

Tonight On Your VIC





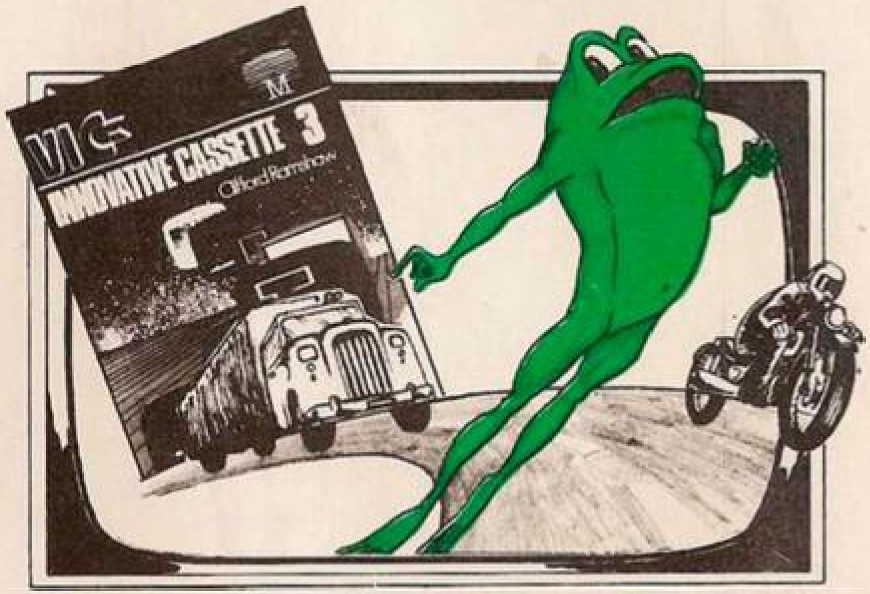
CONVERT YOUR VIC INTO AN ARCADE MACHINE

Amazing arcade action for the standard VIC 20 with 5 new exciting games from Clifford Ramshaw: ALIEN BLITZ* INVADERS* GROUND ATTACK, STORM and SPACE ROCKS* (games marked * contain machine code). You must have the VIC GAMES PACK cassette - only $5.95.

RESCUE A VIC PRINCESS

A multi-part adventure for the standard VIC 20! All you have to do is find the castle, defeat the dragon, find your way through the labyrinth, kill the wizard and rescue the Princess. And that's not half of it! THE WIZARD & THE PRINCESS cassette only £5.95.





IS THERE LIFE AFTER THE ALIEN OVERUN?

You'll find out in Clifford Ramshaw's book VIC INNOVATIVE COMPUTING - undoubtedly one of the finest collections of BASIC programs. Only £6.95.

HOP YOUR WAY THROUGH THE NIGHT!

All the programs from the book VIC Innovative Computing are available now on cassette. Each cassette £5.95.

MELBOURNE HOUSE PUBLISHERS

Orders to: 131 Trafalgar Road, Greenwich, London SE10

Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA

Trade enquiries welcome.

☐ Please send me your free catalogue.

Please send me:

Books

SPECTRUM

- ☐ Understanding Your Spectrum £7.95
- ☐ Spectrum Machine Language For The Absolute Beginner £6.95
- ☐ Over The Spectrum £6.95
- ☐ The Complete Spectrum ROM Disassembly £9.95
- ☐ Spectrum Hardware Manual £5.95

DRAGON

- ☐ Enter The Dragon £5.95

ZX81

- ☐ Machine Language Made Simple for the ZX80 & ZX81 £8.95
- ☐ Not Only 30 Programs £4.95
- ☐ Understanding Your ZX81 ROM £8.95
- ☐ Complete Sinclair Basic Course £17.50
- ☐ Basic Course cassettes £2.50
- ☐ Complete Sinclair ZX81 Rom Disassembly Part A & B £9.95
- ☐ Ins and Outs of the ZX81 £5.95

VIC 20

- ☐ VIC Innovative Computing £6.95

Cassettes

16K SPECTRUM

- ☐ Over The Spectrum No. 1 £5.95
- ☐ Over The Spectrum No. 2 £5.95
- ☐ Over The Spectrum No. 3 £5.95
- ☐ Programs from Spectrum Machine Language Book £5.95

DRAGON 32

- ☐ Enter The Dragon Super Cassette A £5.95
- ☐ Enter The Dragon Super Cassette B £5.95

48K SPECTRUM

- ☐ Penetrator £6.95
- ☐ The Hobbit £14.95

STANDARD VIC 20

- ☐ VIC Innovative Cassette 1 £5.95
- ☐ VIC Innovative Cassette 2 £5.95
- ☐ VIC Innovative Cassette 3 £5.95
- ☐ VIC Games Pack £5.95
- ☐ The Wizard & The Princess £5.95

All prices include VAT where applicable

£ ________

Please add 80p for post and pack £ .80

TOTAL £ ________

All Melbourne House cassette software is unconditionally guaranteed against malfunction.

Access orders can be telephoned through on our 24-hour ansafone (01) 858 7397.

I enclose my cheque/money order for £ ________

Please debit my Access card No. ________ Expiry date ________ Signature ________

Name ________ Address ________

________ Postcode ________ YC4

MELBOURNE HOUSE PUBLISHERS

(continued from page 103)

There is an odd quirk in 6502 when adding up: the only Add command we have is ADC — add with carry. This takes the contents of the carry flag and adds them to the result of the original calculation we were hoping to make. If the carry flag were set then — say it was set to 1 — the result obtained when the ADC is performed would be 1 too high. So the CLC command sets carry equal to zero and we should get the right result.

So now we have our machine-code program in the form of op-codes and operands, where can we put this little masterpiece? On the Vic-20, it is best placed directly under the screen memory, as here it will not interfere with Basic at all.

A program to Poke our machine-code program into memory is given in figure 2.

Type it in and Save it. Check lines 50, 60 and 100 especially as any mistake here could cause a crash. When "Finished" appears our program has been loaded into bytes 6700 6707. To run this program we use the Sys command. To run the machine code starting at 6700, type in

SYS 6700

and hit Return. You should get an almost instantaneous reply of "Ready" and the cursor blinking. The machine has run the program, but it was so fast that you did not notice. To check that it has done something try —

PRINT PEEK (00) + PEEK (1), PEEK (2)

As location 2 = location 0 + location 1, the two printed numbers should be the same.

The stack is an area of memory situated around 600-650 reserved for remembering data in a first in last out — FILO — manner. It is called a stack because of its similarities with a stack of other things, for example, plates. If you have a stack of plates and then add a plate to the top of this stack, then the next plate you take from that stack must be the one you have just added. The same is true for our memory stack. The last item to be pushed into the top of the stack will be first to be pulled off it.

It is by using the stack that Basic returns from a subroutine to the right place, knows when it has finished a For-Next loops and so on. The pointer which tells the 6502 what position it is at in the stack is the stack pointer register SP. As return addresses are added to the stack each time a subroutine call is made, it is best to avoid using the stack as much as possible. Unless you keep a strict record of what exactly you are doing, what you put in might not be what you get out at some later date.

The status register — SR — is better considered as a group of eight bits rather than just one byte. It contains seven flags and one unused bit. They appear as —

Bit number	7	6	5	4	3	2	1	0
Symbol	N	V	—	B	D	I	Z	L

Bit 7 is the sign bit. It is set whenever a result from Add instruction is a negative number in two's complement format. Translating this, it means that N bit will be the same as Bit 7 in the accumulator after many operations.

Bit 6 is the overflow flag used in two's complement subtraction when the result could be wrong due to a carry from Bit 6 to Bit 7. Bit 5 is unused.

Op-code	Operand	Mnemonic	Operand	Basic equivalent
A9	03	LDA#	03	A = 03
85	05	STA	05	Poke 5, A
60		RTS		Return

Figure 1.

Bit 4 is the Break flag and is set after the Brk instruction to let us know that it is a software, not hardware, break. Bit 3 is the Decimal flag and informs the processor whether to use BDC or binary representations of data. Bit 2 is the interrupt flag, when set, it will prevent any interrupts.

Bit 1 is my personal favourite. This is the zero flag and is used to indicate that the result of any particular operation equals zero.

Bit 0 is the carry flag which is used for a carry during additions. It can often be thought of as an eighth bit during additions. These flags form the basis of all the Conditional Jumps in 6502 assembly.

We get the following branches:

		Branch	Status register
BCC	—	if carry clear	C=0
BCS	—	if carry set	C=1
BEG	—	if equal to 0	Z=1
BMI	—	if minus (negative)	N=1
BNE	—	if not equal to 0	Z=0
BPL	—	if plus (positive)	N=0
BVC	—	if overflow clear	V=0
BVS	—	if overflow set	V=1

These branches correspond to the If-Then-Goto sequence, except that one does not specify a branch and an address but a branch and a displacement between 127 and −126. This displacement is added to the program counter — PC, or two-byte register which contains the address of the instruction currently being executed — to send it either forward or backward by that displacement.

To illustrate this, here are two programs; the first clears the screen, the second zips up and down the music scales. The asterisks on the programs indicate a memory byte to be skipped in the branch instruction.

Assembly code	Mnemonics
A2 00	LDX # 0
A9 20	LDA # $20
9D* 00* 1E*	STA $1E00,X
9D* 00* 1F*	STA $1F00,X
CA*	DEX
D0* F8*	BNE $F8
60	RTS

```
10 POKE 56, 26: POKE 52, 26: REM
   RESERVE SPACE FOR THE
   PROGRAM
20 COUNT = 0: REM POINTER TO
   DATA
30 READ D$ : IF D$ = "*" THEN PRINT
   "FINISHED" : END
40 D1$ = LEFT $ (D$,1) : D2$ = RIGHT
   $ (D$,1) : REM CONVERT
   HEXADECIMAL
50 V = (ASC (D1$) - 48 + ((ASC (D1$)
   >64) *7)) *16 :
60 V = V + (ASC (D2$) - 48 + ((ASC
   (D2$)>64) * 7)) : REM DECIMAL
70 POKE 6700 + COUNT, V : REM
   STORE THE MACHINE CODE IN 6700
   ONWARDS
80 PRINT (6700 + COUNT) ; V : COUNT
   = COUNT + 1 : GOTO 30 : REM
   REPEAT FOR NEXT BYTE
99 REM : HERE IS THE DATA OF THE
   PROGRAM
100 DATA 18, A5, 00, 65, 01, 85, 02, 60:
110 DATA * : REM END OF DATA.
```

Figure 2.

The Basic equivalent of this program would look like this:

```
10 X = 256
20 A = 32
30 Poke 7680 + X, A
40 Poke 7936 + X, A
50 X = X - 1
60 IF X <> 0 Then 30
70 END
```

The F8 in the branch instruction is the displacement mentioned and is obtained thus: count how many bytes are needed to skip backward, in this case 89. Then this is converted to eight-bit binary. One's complement is then calculated in binary and 1 is added to obtain two's complement. The resultant sum looks like this:

= 89
= 00001001
= 11110110
= 11110110
1+
= 11110111

The eight-bit binary is then converted to two-bit hex: F7 is the result. If a line 5 is added to the Basic program

5 FOR I=0 TO 512 : POKE 7680+I,160 : NEXT

and the rest entered and Run, this will show you what the machine-code program does. To enter the machine code, change line 100 in figure 2 to:

100 Data A2,00,A9,20,9D,00,1E,9D,00,1F,CA, D0,F8,60

Do not forget to Save, then Run, just in case. To run the machine code try Sys 6700. The program should respond with a blank screen and a "Ready" plus cursor.

Here is the second program.

Op-code	Operand	Mnemonic
A9	0F	LDA # 0F
8D	0E 90	STA 90DE
A2	FF	LDX# FF
A0	00	LDY # 00
CA*		DEX
8E*	0A* 90*	STX 900A
8C*	0B* 90*	STY 900B
C8*		INY
F0*	F6	BEQ F6
60		RTS

The Basic equivalent looks like this:

```
10 A=15
20 POKE 36878,A
30 X=255
40 Y=0
50 X=X-1
60 POKE 36874,X
70 POKE 36875,X
80 Y=Y+1
90 IF Y=0 OR Y=256 THEN 50
100 END
```

The F6 in the branch-if-equal-to-0 command is obtained by the same process as was used to obtain F7 previously.

To enter this program change line 100 to

100 Data A9,0F,8D,0E,90,A2,FF,A0,00,CA
102 Data 8E,0A,90,8C,0B,90,C8,F0,F6,60

When the program has been Saved, try Sys 8700. This will Run the program, but it may be a bit fast, so until next time, can you think of a machine-code routine to slow it down? ■

NEWNES PROGRAMMING BOOKS

A series of programming books specially written for micro users. The first book in the series is a general introduction that summarises all of the commonly used micro languages. Books two and three cover BASIC and Pascal, and later books will deal with COBOL, FORTRAN, FORTH, assembly language etc.

all: £5.95 216×135 mm

PROGRAMMING LANGUAGES FOR MICROS

Garry Marshall BSc, PhD, MIEE
Principal Lecturer, The Polytechnic of North London

• Sample programs for each language • Useful to students of computer programming, personal computer enthusiasts, as well as potential users in industry and in business.

0 408 01185 8   136 pages

BASIC FOR MICROS

Jeff Maynard
Group Telecommunications Manager, BICC plc

• Introduction to the fundamentals of programming and BASIC for popular microcomputer systems. • Each aspect of BASIC and its uses is explained by example. It is not necessary to own a microcomputer to benefit from the book, but the reader who has one can derive additional enjoyment from running the programs listed in the text.

0 408 01224 2   128 pages

PASCAL FOR MICROS

Mike James BSc, Grad IMA, MACS, FSS
Senior Lecturer, Teeside Polytechnic

• Specially written for the first time user of Pascal. • Sets out to teach you how to write your own Pascal programs for your microcomputer. A survey of the versions of Pascal available on different micros is included and attention is paid to their special features throughout the book.

0 408 01249 8   176 pages

ALSO OF INTEREST...

6502 MACHINE CODE FOR BEGINNERS

A P Stephenson

The author of several books and a regular contributor to the microcomputer press has here produced a very readable and lively introduction to *6502 Machine Code for Beginners*. Specially written for owners of 6502 based microcomputers, BBC Micro, Acorn Atom, Pet, Apple etc.

0 408 01311 7   160 pages   £5.95

Newnes Technical Books
Borough Green, Sevenoaks, Kent TN15 8PH

ORDER NOW from your local Bookseller
A catalogue giving details of all our computer titles is available from Newnes Technical Books — an imprint of Butterworth & Co (Publishers) Ltd, Borough Green, Sevenoaks, Kent TN15 8PH

JAYSOFT Business and leisure software for home computers.



Be the James Onedin of the Far East – borrow $5000, make $100,000 from trading exotica & retire... **If** you survive the true to life hazards of money lenders & market forces. Available for ZX81, SPECTRUM, DRAGON 32. **£4.95.**



A simple user friendly program structured to maximise storage space. With at least 9 headings, it will document up to 80 records on 16K, 240 on 48K. Available for ZX81, SPECTRUM, soon on DRAGON 32. **£4.95.**



Your Personal Accounting Utility Ledger keeps track of your finances & even helps with tax returns – a boon for the self employed. Prepared in consultation with Professional Auditors. Available now for ZX81, soon for 48K SPECTRUM & DRAGON 32. **£7.95** (16K) **£8.95** (48K) (Trade in 16K for 48K £4.45.)

We will endeavour to send you the tape by return post.

JAYSOFT, 6 Wentworth Drive, Bishop's Stortford, Herts.
Please send for further information.

REGISTERED REFERRAL CENTRE FOR THE BBC PROJECT

BEEBUG FOR THE BBC MICRO

INDEPENDENT NATIONAL USER GROUP FOR THE BBC MICRO

MEMBERSHIP NOW EXCEEDS 14,000

14,000 MEMBERS CAN'T BE WRONG — BEEBUG PROVIDES THE BEST SUPPORT FOR THE BBC MICRO. BEEBUG MAGAZINE — NOW 56 PAGES INCLUDING NEW PRODUCT GUIDE SUPLEMENT — DEVOTED EXCLUSIVELY TO THE BBC MICRO. Programs — Hints & Tips — Major Articles — News — Reviews — Commentary. PLUS members discount scheme with National Retailers. **PLUS** members Software Library. — a growing range of software from around £3.50 per cassette. 10 Magazines a year. First issue April 1982. Reprints of all issues available to members.

October Issue. Program Features : Alien Attack, Calendar Generator, Union Jack, and Memory Display Utility. Plus articles on Debugging, Improving Key Detection. Acorn Press Release on O.S. 1.2 and Issue II Basic, The Tube and Second Processor Options, a New Series for Less Experienced Users and Software Reviews.

Dec/Jan Issue. Program Features: Space City (Invader type game), Breakout, Artist (joystick painting program), Rescue (miraculously retrieves program after Bad Loading or "Bad Program Message") and Pack — a program to compact basic programs and disc system review. Software reviews — including Wordwise, Book reviews, adding Joysticks, interface to Model A. How to assess the video controller chips and ideas for the newcomer, plus a new crop of hints and tips.

Gebruary Issue: Program Features: BEEBMAZE — Find your way through the random maze, guided by 3D views from inside the maze — an excellent game. FIVE-DICE — A Beeb implementation of YAHTZEE (R), a novel dice game. Also a listing of WINDY FIELD — a creation from Acornsoft, SPIROPLOT screen doodler, and a complete memory display program in a user key. Plus Machine Code Screen Dumps for the Epson and Seikosha Printers; articles on USING FILES, IDEAS ON ANIMATION (including a Rotating Cube program) an Introduction to the use of Procedures, a Survey of Books on the BBC Micro, and a Roundup of Disc System Hints. PLUS a variety of HINTS, TIPS AND INFO, including a single VDU command to perform a SIDEWAYS SCROLL. WIN A COLOUR MONITOR, WORDWISE WORD PROCESSORS AND ACORNSOFT GRAPHICS BOOKS IN OUR THIRD SOFTWARE COMPETITION.

MEMBERS SOFTWARE LIBRARY +

Offers members a growing range of software from £3.50 per cassette.
1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K7. 3. shape Match (16K). Mindbender (16K). 4. magic Eel (32K7. 5. Cylon Attack (32K). 6. Astro-Tracker (32K).

Utilities: 1. Disassembler (16K). Redefine (16K). Mini Text Ed (32K).
Applications: 1. Superplot (32K). 2. Masterfile (3 ZX).
13% discount to members on the excellent wordwise word processing package — This represents a saving of over £5.00.

STOP PRESS

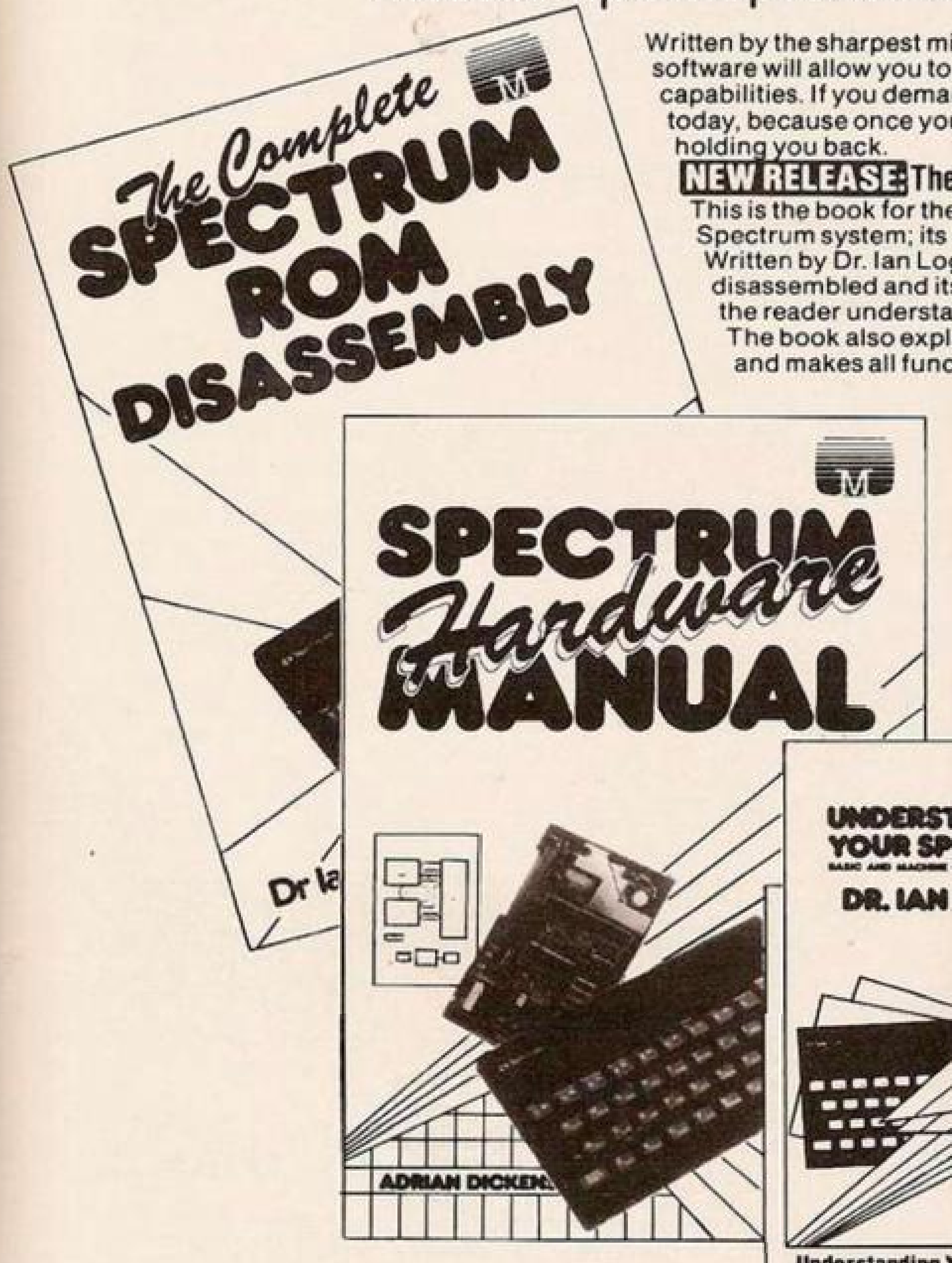
BEEBUG has negociated a deal with ACORN over the new 1.2 OPERATING SYSTEM ROM. BEEBUG members are offered the ROM at around half-price. See BEEBUG Feb issue for details.

Send £1.00 & SAE for Sample.
Membership: UK 5.40 for six months
9.90 for one year
Overseas one year only:
Europe £16.00 Middle East £19.00
Americas & Africa £22,000
Other Countries £23.00

Make cheque to BEEBUG
and send to:
BEEBUG Dept 4
374 Wandsworth Rd.
London SW8 4TE
Editorial Material to PO Box 50,
St Albans, Herts. AL1 1AR

Is your Spectrum holding back?

Unlock all the secrets of your Spectrum with the most complete Spectrum Software Library available.



Written by the sharpest minds in micro technology today, this comprehensive library of software will allow you to maximise the entire range of your Spectrum's impressive capabilities. If you demand the best from your Spectrum, cut out and mail the coupon today, because once you've unlocked all the secrets of your Spectrum – there'll be no holding you back.

NEW RELEASE: The Complete Spectrum ROM Disassembly

This is the book for the serious programmer who wants to get right to the heart of the Spectrum system; its 16K ROM control program.
Written by Dr. Ian Logan and Dr. Frank O'Hara, each ROM routine is completely disassembled and its function clearly explained. Great care is also taken to ensure the reader understands how all the routines within the ROM interact with each other. The book also explains every aspect of the Spectrum's software operation in detail and makes all functions and entry points available for use in your own programs and routines. **£9.95**

NEW RELEASE: Spectrum Hardware Manual

An essential aid for every Spectrum user, giving an easy to follow explanation of how this sophisticated micro computer really works, written by Adrian Dickens.
Backed up with a complete rundown on each component's function and full circuit diagrams, the book reveals many features of the Spectrum system not mentioned in the Sinclair Manual.
The book also includes practical hardware projects and tips enabling you to take full advantage of the system's hardware potential. **£5.95**



Understanding Your Spectrum
A complete overview of Spectrum software systems explaining both BASIC and machine language programming. **£7.95**

Over the Spectrum
30 exciting programs and games to test you and your Spectrum plus many programming hints and tips too. **£6.95**

Spectrum Machine Language For The Absolute Beginner
Everything the first time user needs to know about Spectrum Machine language. **£6.95**

MELBOURNE HOUSE PUBLISHERS

Orders to: 131 Trafalgar Road, Greenwich, London SE10

Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA

Trade enquiries welcome.

☐ Please send me your free catalogue.
Please send me:

Books

SPECTRUM
- ☐ Understanding Your Spectrum £7.95
- ☐ Spectrum Machine Language For The Absolute Beginner £6.95
- ☐ Over The Spectrum £6.95
- ☐ The Complete Spectrum ROM Disassembly £9.95
- ☐ Spectrum Hardware Manual £5.95

DRAGON
- ☐ Enter The Dragon £5.95

ZX81
- ☐ Machine Language Made Simple for the ZX80 & ZX81 £8.95
- ☐ Not Only 30 Programs £4.95
- ☐ Understanding Your ZX81 ROM £8.95
- ☐ Complete Sinclair Basic Course £17.50
- ☐ Basic Course cassettes £2.50
- ☐ Complete Sinclair ZX81 Rom Disassembly Part A & B £9.95
- ☐ Ins and Outs of the ZX81 £5.95

VIC 20
- ☐ VIC Innovative Computing £6.95

Cassettes

16K SPECTRUM
- ☐ Over The Spectrum No. 1 £5.95
- ☐ Over The Spectrum No. 2 £5.95
- ☐ Over The Spectrum No. 3 £5.95
- ☐ Programs from Spectrum Machine Language Book £5.95

DRAGON 32
- ☐ Enter The Dragon Super Cassette A £5.95
- ☐ Enter The Dragon Super Cassette B £5.95

48K SPECTRUM
- ☐ Penetrator £6.95
- ☐ The Hobbit £14.95

STANDARD VIC 20
- ☐ VIC Innovative Cassette 1 £5.95
- ☐ VIC Innovative Cassette 2 £5.95
- ☐ VIC Innovative Cassette 3 £5.95
- ☐ VIC Games Pack £5.95
- ☐ The Wizard & The Princess £5.95

All prices include VAT where applicable

£ ______

Please add 80p for post and pack £ .80

TOTAL £ ______

All Melbourne House cassette software is unconditionally guaranteed against malfunction.
Access orders can be telephoned through on our 24-hour ansafone (01) 858 7397.

I enclose my cheque/money order for £ ______

Please debit my Access card No. ______ Expiry date ______ Signature ______

Name ______ Address ______

______ Postcode ______ YC4

MELBOURNE HOUSE PUBLISHERS

NEW SPECTRUM SOFTWARE

48K SPECTRUM
Super Spy

An exciting espionage adventure in which you follow the villain's trail through complex puzzles, coded messages and 3-D mazes. With different solutions every game Super Spy will keep you entertained for weeks! Full 'save' routine. **£6.50**

48K SPECTRUM
Everest Ascent

Stake your claim to the Top of the World in this gripping vertical adventure in which you aim to conquer the 29,141' summit of the world's highest peak.
Struggle from base camp to base camp in defiance of all the obstacles which man and nature can throw at you! Survive intense cold as you watch out for avalanches, thin ice and, of course, abominable snowmen! Cope with wayward Sherpas and cross bottomless crevasses but remember to watch your oxygen supply! A game of skill, cunning, bravery and daring for those with a head for heights! **£6.50.**

48K SPECTRUM
Transylvanian Tower

A spine-chilling adventure with spectacular 3-D graphics. Can you rid the world of Count Dracula before he introduces you to the dark world of the living dead? Horror film addicts will know most of the moves, but we've also added a few of our own! Can you discover the mystery of the turret and escape with its treasures?
Enter via the dungeons and work your way up to the terrifying top! Find objects to help you whilst exploring the 500 rooms – all in exciting 3-D detail – but watch out for the bats.
Give your Spectrum a bite of the action now!
Includes full save routine for use during the daylight hours! **£6.50**



Now available from selected branches of W.H. Smith & Son Ltd.

16K SPECTRUM
Ship of the Line

An Adventurous Management Game

Command a 17th Century sailing ship ... win victories for Britain ... juggle your supplies, manpower and ammunition ... fearlessly battle your way up the ranks ... and finally achieve promotion to First Sea Lord, but beware ... it won't be easy! Encounter and engage enemy fleets ... survive sunstroke, fever and famine ... endure fire, fog and thirst ... then ... when you think you've done well ... rush back to Port for promotion! With full colour, ship graphics and sound ... **£4.95**

For credit card orders please ring 0628 21107.

48K SPECTRUM
Ship of the Line

48K version features the chance to send out boarding parties, to build up prize money, to take intelligence tests and to bribe your way up the admiralty ladder! This greatly extended version of Ship of the Line really makes the most of your extra memory. **£6.50**

16K ZX81
Bargain Bytes Cassette One

Deep Sea Adventure * Bank Account * Underground Adventure * Depthcharge * Hangman * Loan Calculator * Codebreaker * Foreign Currency Calculator. A genuine bargain!

Eight interesting programs for just **£5.00**

16K ZX81
Bargain Bytes Cassette Two

Stock Market Game * Seafaring Adventure * Jackpot * OXO * Financial Model * Ski Run * General Knowledge Quiz * Copycat.

Too many programs to desribe for only **£5.00**
Ideal as a ZX81 Starter Pack!

48K SPECTRUM
Multi Function Cash Controller

If you want to make your machine work for you, this is an ideal program ...
Cash Controller has four basic functions; it keeps your Bank Account in order, it looks after your Home Budgeting, it calculates loan interest and repayments, and finally it checks your mortgage for you. In addition, it only lets you into the program by means of your own secret password which you personally choose. Once you've allocated budget headings, any transactions you put through the Bank Account will automatically be taken into account on your budgets.
Using a Sinclair printer, hard copy statements can be produced running from any date to any date; much more versatile than your regular bank statement! This program has been carefully crash-proofed to prevent a minor error from scrambling the existing data, and comes with clear on-screen instructions plus full printed notes to help you on your way. Finally, it holds up to 200 bank transactions and fills up most of the memory of your 48K Spectrum. **£10.00**

Despatch within 48 Hours Guaranteed.
All tapes despatched by First Class Post.

Richard Shepherd Software FREEPOST (No stamp required), Maidenhead, Berks SL6 5BY.

OFFER!
Buy 2 get £1 off
Buy 3 get £2 off
Buy 4 get £3 off

Please send me:

48K Spectrum	Super Spy	at £ 6.50	
48K Spectrum	Transylvanian Tower	at £ 6.50	
48K Spectrum	Everest Ascent	at £ 6.50	
48K Spectrum	Ship of the Line	at £ 6.50	
48K Spectrum	Cash Controller	at £10.00	
16K Spectrum	Ship of the Line	at £ 4.95	
16K ZX81	Bargain Bytes One	at £ 5.00	
16K ZX81	Bargain Bytes Two	at £ 5.00	

Discount for buying two or more? ....
Less £ ....
TOTAL ....

I enclose Cash/Cheque/Postal Order payable to Richard Shepherd for £ ....

Name ....
Address ....
Postcode ....

Send your order immediately to Richard Shepherd Software, Freepost (no stamp required), Maidenhead, Berks. SL6 5BY

SPECTRUM ANIMATION



Blast off into a new fast-action, flicker-free universe with Robert Newman's smooth-animation machine-code routines.

16K AND 48K

THE PROVISION of colour, sound and user-definable high-resolution graphics on the Sinclair Spectrum encourages many people to try writing arcade-style games for their computer. Such programs require fast-action, flicker-free graphics if they are to be successfull and excitingly implemented on Spectrums.

The usual method of producing the illusion of movement involves first printing an object at one position, and then erasing it and printing one character position further along the screen. This method is certainly fast enough when used in Basic programs on the Spectrum if only one or two graphics characters require animation, but the movement has a jerky appearance, because the smallest distance that a character can be moved is one print position. There are only 32 positions across the screen, or 22 from top to bottom.

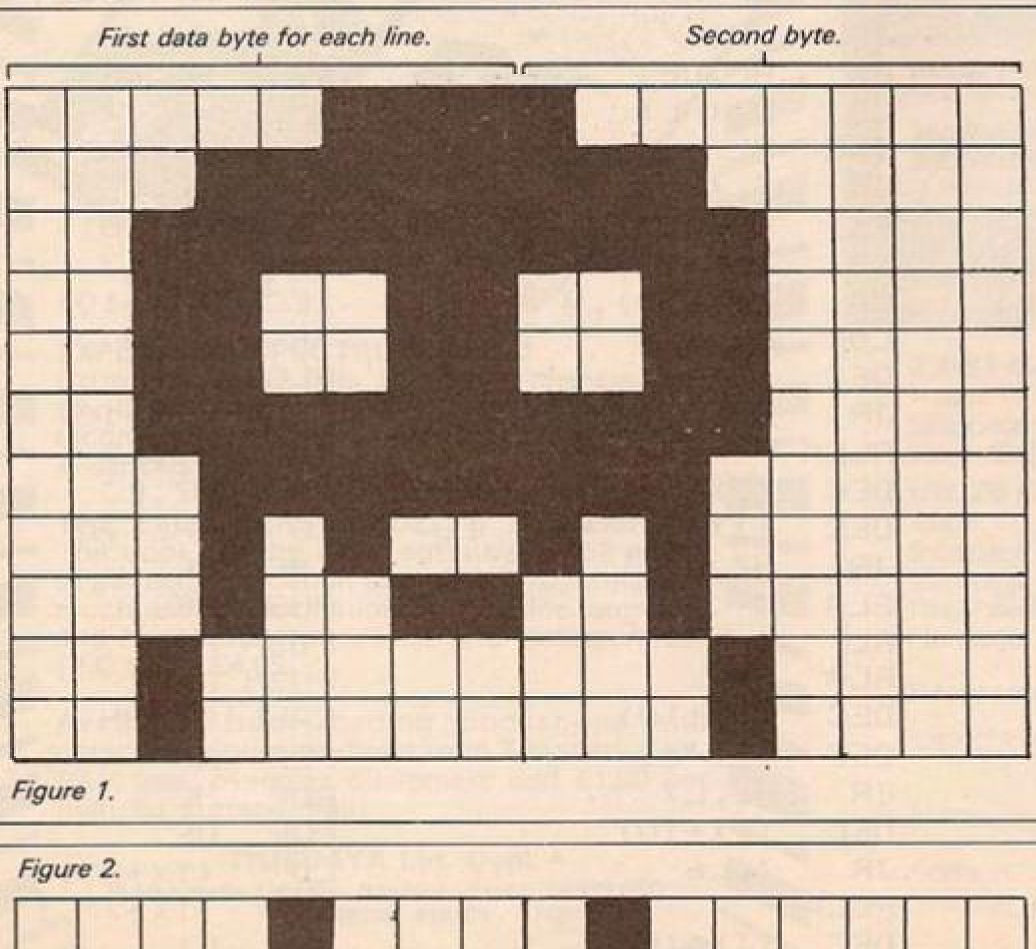


Figure 1.

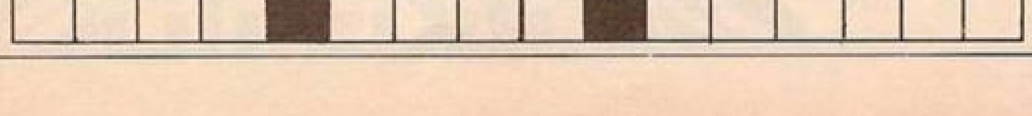


Figure 2.

Another disadvantage of Basic is that the action slows down noticeably when several characters are required to move, or if the graphics are large, involving printing on a number of lines or across several columns. Most commercially-written software uses machine code in order to achieve the required speed and smoothness of movement, but writing an entire game in machine code is not a task that most home programmers would relish. It is therefore necessary to consider other methods for speeding up the action in Basic programs.

Smooth routine

On the ZX-81 it is possible to short-cut the Print statement by Poking characters directly into the display file, thereby getting slightly faster graphics. Unfortunately the Spectrum's display file is laid out in a very complicated fashion — see page 164 of the manual — and it is not really feasible to do the same thing on this computer.

For this reason I have written a machine-code routine especially for the purpose of enabling games programmers to obtain faster, smoother animation from Basic. It is intended to be used with user-defined graphics characters, which can be made as large as

(continued on next page)

Listing 5.

```
  1 REM ɐulticoloured invaders
  2 REM © R Newman 1983
  3 REM 48K version
  4 REM ---------------------------
  5 CLEAR 65159
 10 PAPER 7: BORDER 7: CLS
 20 FOR y=160 TO 100 STEP -20
 30 GO SUB 100
 40 NEXT y
 50 INK 0
 60 STOP
 70 REM ***************************
100 POKE 65162,14: PUKE 65164,1
110 FOR x=0 TO 100 STEP 2: GO S
UB 200: NEXT x
120 FOR x=100 TO 0 STEP -2: GO
SUB 200: NEXT x
130 POKE 65160,0: POKE 65161,y
140 POKE 65162,140: POKE 65163,
11
150 POKE 65164,0
160 RANDOMIZE USR 65171
170 RETURN
180 REM ***************************
200 POKE 65161,y: POKE 65165,11
210 POKE 65165,1
220 GO SUB 300
230 POKE 65161,y-9: POKE 65163,
2
240 POKE 65165,4
250 GO SUB 300
260 RETURN
270 REM ***************************
300 FOR c=0 TO 6: PRINT INK c;
310 POKE 65160,c*20+x
320 RANDOMIZE USR 65171
330 NEXT c
340 RETURN
350 REM ***************************
```

Listing 1. Machine-code dump.

2	175	8	8	1	1
0	0	0	0	0	221
42	178	92	221	35	42
123	92	221	94	5	29
203	35	203	35	203	35
22	0	25	235	221	78
0	221	70	1	221	126
3	245	197	221	126	2
221	119	6	205	170	34
221	119	7	221	52	7
47	230	7	60	221	119
8	213	229	205	219	11
225	209	221	203	4	70
32	5	1	0	0	24
5	235	70	35	78	235
221	54	9	8	221	54
10	9	126	221	53	7

40	9	7	221	53	10
221	53	7	32	247	203
33	203	16	23	221	53
10	221	53	6	32	19
221	53	10	40	6	7
221	53	10	32	250	119
193	241	5	61	32	155
201	221	53	9	32	10
221	203	4	70	40	4
235	35	78	235	221	53
8	32	204	221	53	10
40	6	7	221	53	10
32	250	119	35	213	229
245	205	219	11	241	225
209	221	54	8	8	221
54	7	1	24	153	

(continued from previous page)

desired and printed by a single call to the routine. In addition, the graphics can be located at any position on the 256 × 176 high-resolution screen, and can therefore be made to move by as little as one point at a time. This is a considerable improvement over the coarse 32 × 22 resolution normally obtainable. The colour of the graphics can be controlled from Basic with the normal Ink, Paper, Bright and Flash statements.

The machine code occupies 197 bytes, and the safest way to store it is to move RAMtop downwards in memory, using the Clear command, and place the code between the Basic area and the user-defined graphics.

The address of the routine will therefore be different for 48K and 16K Spectrums. The routine itself, however, is the same for both computers, and a dump of the machine code is given in listing 1. Owners of 48K machines can use the loader program in listing 2. Enter this program and Run it, inputting the numbers from listing 1 as prompted: read the numbers from left to right. I would advise you to check the machine code before Saving it or attempting to use it. This can be done with the

(continued on page 115)

Listing 3. Disassembled machine-code.

```
        ORG   65160
XPOS    DEFB  2
YPOS    DEFB  175
WIDTH   DEFB  8
HT      DEFB  8
MODE    DEFB  1
UDGCH   DEFB  1
        DEFB  0
        DEFB  0
        DEFB  0
        DEFB  0
        DEFB  0
;
START   LD    IX,(23730)
        INC   IX
        LD    HL,(23675)
        LD    E,(IX+5)
        DEC   E
        SLA   E
        SLA   E
        SLA   E
        LD    D,0
        ADD   HL,DE
        EX    HL,DE
        LD    C,(IX+0)
        LD    B,(IX+1)
        LD    A,(IX+3)
LINE    PUSH  AF
        PUSH  BC
        LD    A,(IX+2)
        LD    (IX+6),A
        CALL  22AAH
        LD    (IX+7),A
        INC   (IX+7)
        CPL
        AND   7
        INC   A
        LD    (IX+8),A
        PUSH  DE
        PUSH  HL
        CALL  0BDBH
        POP   HL
        POP   DE
        BIT   0,(IX+4)
        JR    NZ,5
        LD    BC,0
        JR    LN1
        EX    HL,DE
        LD    B,(HL)
        INC   HL
        LD    C,(HL)
        EX    HL,DE
LN1     LD    (IX+9),8
L1      LD    (IX+10),9
        LD    A,(HL)
        DEC   (IX+7)
        JR    Z,L3
L2      RLCA
        DEC   (IX+10)
        DEC   (IX+7)
        JR    NZ,L2
L3      SLA   C
        RL    B
        RLA
        DEC   (IX+10)
        DEC   (IX+6)
        JR    NZ,L7
        DEC   (IX+10)
        JR    Z,L6
L5      RLCA
        DEC   (IX+10)
        JR    NZ,L5
L6      LD    (HL),A
        POP   BC
        POP   AF
        DEC   B
        DEC   A
        JR    NZ,LINE
        RET
L7      DEC   (IX+9)
        JR    NZ,L4
        BIT   0,(IX+4)
        JR    Z,L4
        EX    HL,DE
        INC   HL
        LD    C,(HL)
        EX    HL,DE
L4      DEC   (IX+8)
        JR    NZ,L3
        DEC   (IX+10)
        JR    Z,L8
L9      RLCA
        DEC   (IX+10)
        JR    NZ,L9
        JR    NZ,L3
L8      LD    (HL),A
        INC   HL
        PUSH  DE
        PUSH  HL
        PUSH  AF
        CALL  0BDBH
        POP   AF
        POP   HL
        POP   DE
        LD    (IX+8),8
        LD    (IX+7),1
        JR    L1
;       END
```

48K SPECTRUM

STOP STRUGGLING TO WRITE YOUR OWN BANKING PROGRAM — OURS GIVES YOU ALL OF THE FEATURES YOU REQUIRE!

THE PERSONAL FINANCE SYSTEM IS A PROFESSIONALLY WRITTEN, MENU-DRIVEN SYSTEM FOR THE MAINTENANCE OF YOUR CURRENT ACCOUNT.

FEATURES:

★ Automatic posting of standing payments.
★ Details of Payee etc. maintained for all entries.
★ All entries maintained in chronological sequence.
★ Full validation of all input.
★ All standing payments and credit/debit entries fully updatable/deletable on-screen.
★ Full search facilities.
★ Reconciliation to your bank statement.
★ Future Balance feature gives current account balance on a specified date — e.g. usable income after all standing payments deducted for current month.
★ Output to ZX printer if required.
★ System status screen.
★ Multiple bank accounts handled.
★ Full after-sales service.

VERIFIED CASSETTE AND FULL USER DOCUMENTATION FOR ONLY **£4.95** FROM

FOREST SOFTWARE, 45 SOUTHWOLD, BRACKNELL, BERKSHIRE RG12 4XY



EXPLORING SPECTRUM BASIC
Complements the Sinclair manual by explanations of BASIC programming techniques supported by over 50 full games & serious programs. 191 pages. £4.95

THE EXPLORERS GUIDE TO THE ZX81
The book for the ZX81 enthusiast. 152 pages of games, application and utility programs plus much useful information on machine language and hardware. "Immediate and lasting value" (P.C.W.). £4.95

Available from leading bookshops and computer stores, or direct from Timedata (U.K. P&P free, overseas customers add £1.50 per item for surface mail).

TIMEDATA Ltd. Dept. A
16 Hemmells, Laindon, Basildon, Essex. SS15 6ED
Tel.: (0268) 418121

TIMEDATA

QUICKSILVA

are proud to announce they are now marketing

PIXEL GAMES

TRADER

A trilogy of 16K programmes that combine to give an epic 48K graphic adventure. As a galactic trader, you deal with some very bizarre customers indeed. Will you live to tell the tale?



SUBSPACE STRIKER
With your deadly Antimat torpedoes, you unleash havoc in the Federation spacelanes and try to dive back to the safety of subspace, fast.
+ **ZOR** — Battle of the robots. Fight for survival in this action-packed strategy game.

STARQUEST
With the help of your on-board computer, you seek a habitable planet amidst the perils of deep space.
+ **ENCOUNTER** — In this adventure, you are snatched off the Earth and the space invaders play YOU!

PIXEL POWER A graphics workshop packed with useful features like Create, Amend, Save, View Set.

HARVESTER A cut-throat strategy game for 2 to 4 players.

BRAINSTORM Can you get our three space explorers across a river of nasty goo without blowing their minds.

SUPPLIED ON CASSETTE

Send order to: QUICKSILVA, DEPT SPD, 92 NORTHAM ROAD, SOUTHAMPTON, SO2 0PB

ZX-81 GAMES			
Trader	ZX-81 + 16K RAM	£9.95	☐
Subspace Striker + Zor	ZX-81 + 16K RAM	£3.95	☐
Starquest + Encounter	ZX-81 + 16K RAM	£3.95	☐
VIC20 GAMES			
Trader	VIC20 + 16K RAM	£14.95	☐
Subspace Striker + Zor	VIC20 + 16K RAM	£7.95	☐
Starquest + Encounter	VIC20 + 16K RAM	£7.95	☐
Pixel Power	VIC20 + 16K RAM	£7.95	☐
Harvester + Brainstorm	VIC20	£7.95	☐

Please send me the games as ticked.

Total cheque/P.O. enclosed............

Cheque payable to QUICKSILVA

Name............

Address............

....

....

MICROWARE
Leicester
"THE FRIENDLY TO USER STORE"

SUPER SOFTWARE CLUB

MEMBERSHIP INCLUDES: **20% OFF FIRST TAPE**
15% OFF NEXT THREE TAPES. 10% OFF ALL FUTURE TAPES AS MEMBER

★ Special offers during membership ★ Forthcoming free offers
★ Occasional very special hardware offers ★ Regular Newsletter and Lists
★ Only the best software by the most respected houses stocked

ZX81 · SPECTRUM · DRAGON 32 · ORIC 1 · JUPITER ACE · B.B.C.

TWO SCHEMES

★ MAIL ORDER MEMBERSHIP: **£8.00** ★ SHOP MEMBERSHIP: **£5.00** ★ OPTIONAL LIFE MEMBERSHIP **£5.00** EXTRA
★ SPECIAL SCHEMES FOR 15-YEARS-OLD AND UNDER ★ O.A.P.s ★ UNEMPLOYED
TELEPHONE ACCESS/BARCLAYCARD/VISA ACCEPTED OR S.A.E. FOR FULL DETAILS.

FREE DRAW FOR JUPITER ACE COMPUTER ON APRIL 30th FOR ALL MEMBERS!

You know us! We are genuine! Full refund of fee if not satisfied when membership details arrive or anytime in first six months if genuine complaint is not resolved within 30 days.

"THE FRIENDLY TO USER" STORE
Pop-in to the shop and have a chat about the club if you wish — no obligation.

5 ST. PETERS LANE, LEICESTER. TEL: 0533 29023

THE "FRIENDLY TO USER STORE"

THE FIRST MIDLANDS REGION SHOP SPECIALISING IN **SINCLAIR COMPUTER** ACCESSORIES AND HOME COMPUTING GENERALLY.

STOCKING: SINCLAIR ZX81 and SPECTRUM, DRAGON 32, ORIC 1 and JUPITER ACE. FULL RANGE OF HARDWARE and SOFTWARE.

Possibly the widest range of software available in the Midlands.

BBC software now available!

Sorry! we don't sell: stationery, cameras, hi-fi, TVs, cosmetics or pills, only home computers and accessories!

SEE US AT THE **MIDLAND COMPUTER FAIR** BINGLEY HALL BIRMINGHAM, 28-30 APRIL AND **MICROSCENE** SHEFFIELD, 16th APRIL

SPECIAL MICROWARE'S OWN SOFTWARE FOR THE ZX SPECTRUM.
ALIEN COMMAND 16/48K SPECTRUM **ONLY £4.75**
BACKGAMMON 16/48K SPECTRUM **ONLY £4.50**
YAHTZEE 16/48K SPECTRUM **ONLY £4.50**
Please include 50p post & packaging with software orders.

MICROWARE
Leicester
"THE FRIENDLY TO USER STORE"

5 ST. PETERS LANE
LEICESTER
TEL: 0533 29023
Open 9.30-5.30
closed Monday

SEND S.A.E.
FOR FURTHER DETAILS

(continued from page 112)

same loader program by deleting lines 20, 30, 70 and 90, and changing line 80 to:

80 PRINT TAB 10; PEEK i

If all is correct, you should Save the routine with the command:

SAVE "animate" CODE 65160,197

Owners of 16K computers need to make the following changes. In listing 2, change line 20 to

CLEAR 32389

and line 50 to

FOR i=32390 TO 32586

Save the routine with the command

SAVE "animate" CODE 32390,197

You can now test the routine by clearing the screen and issuing the command:—

RANDOMIZE USR 65171   48K
RANDOMIZE USR 32401   16K

Whereupon the character in user-defined graphic "a" — usually a capital letter A — should appear at the top left-hand corner of the screen. If this does not happen you have made a mistake while entering the machine code.

If the computer has crashed you must remember to reset RAMtop by giving the appropriate Clear command before reloading your copy of the routine and checking it.

If all went as expected, here is how to use the routine from a Basic program. If you examine the disassembled routine in listing 3, you will see that the first 6 bytes are used as variables, XPOS, YPOS and so on. These names will not be recognised if you try to use them in a Basic program, but by Poking different values into these six bytes you can control the operation of the routine as follows.

Routine control

XPOS — address 32390 for 16K, 65160 for 48K — is the X co-ordinate of the top left-hand corner when the graphic character is printed on the screen. Possible values are the same as are allowed for the PLOT command, that is 0 to 255.

YPOS — address 32391 or 65161 — is the Y coordinate of the top left-hand corner of the graphic character when printed on the screen. It may take values from 0 — bottom of screen — to 175 — top of screen.

Width — address 32392 or 65162 — this is the number of points left-right in the character to be printed.

HT — address 32393 or 65163 — is the number of points top-bottom in the character to be printed.

Mode — address 32394 or 65164 — has the value 1 if you wish to print a character at the current position, or 0 if you wish to erase a block of Width × HT points at the current position.

UDGCH — address 32395 or 65165 — this must have a value from 1 to 21, and it tells the routine where to find the data for the character that you want to print. A value of 1 means that the first byte of data is held at address USR "a", that is, the first byte of the user graphic "a", while a value of 21 means that it is held in address USR "u".

Values Poked into these six bytes before calling the routine will be unchanged on exit, so, if printing more than one character, you may not need to update every byte. You will get strange results, or possibly cause a crash if you attempt to set XPOS and YPOS to values which do not permit the character you wish to print to fit onto the screen, and so your Basic program may need to include a check to prevent this.

Different colours

The routine prints the graphic character in the colour defined by the current contents of system variable ATTR T — location 23695. If you want to print characters in different colours, you can set ATTR T from Basic without changing the current print position by using a dummy Print statement such as

PRINT PAPER 6; INK 1;

before calling the routine. The Flash and Bright statements can also be used.

If you use the routine to print user-graphics consisting of eight-by-eight points, then the method of storing the pattern is exactly the same as described in chapter 14 of the user manual. However, the routine can handle graphics of any size, and the method for larger characters is slightly different.

Firstly, design your character on a piece of squared paper. I am going to use the routine to move the character across the screen by two points at a time, and so it is best to leave a margin at left and right edges of two blank columns. The operation of moving left or right by two points and printing at the new position will then automatically print over the old space invader, saving the trouble of erasing it first. The character we want to use therefore consists of 14 by 11 points.

If the width is not an exact multiple of eight, you must add the required number of blank columns to the right-hand edge. The width of the character is then divided into eight-bit sections, which can be described by a Bin number as usual and stored in the user-defined graphics area. A program like that in listing 4 can be used for this. The first byte of data for the character is going to be stored in address given by Usr "a". When entering data for your own characters, remember that the data for the top line is stored first, then the second line and so on.

Since the space invader occupies 22 bytes, that is, all of graphics "a" and "b", plus most of "c", the next unused section begins at USR "d". This is where the four bytes of data needed for the character in figure 2 can be stored. When these two lines are printed over the bottom two lines of the space invader, its legs will appear to move while it moves across the screen. Enter and Run listing 4. You can save the user-graphics if you wish with

SAVE "chars"CODE USR "a",32

Erase listing 4 — you can do this with New

Listing 2.

```
10 REM listing 2 (48K)
20 CLEAR 65159
30 CLS : PRINT "enter numbers from
listing 1" '
40 PRINT : PRINT "address contents"
50 FOR i= 65160 TO 65356
60 PRINT i;
70 INPUT n
80 PRINT TAB 10;n
90 POKE i,n
100 NEXT i

16K users change lines 20 & 50
to:-

20 CLEAR 32389
50 FOR i=32390 TO 32586
```

Listing 4.

```
10 REM character in figure 1
20 FOR i=USR "a" TO USR "a"+21
30 READ n: POKE i,n
40 NEXT i
50 DATA BIN 00000111,BIN 10000000,
  BIN 00011111,BIN 11100000,BIN 00111111,
  BIN 11110000,BIN 00110011,BIN 00110000
60 DATA BIN 00110011,BIN 00110000,
  BIN 00111111,BIN 11110000,BIN 00011111,
  BIN 11100000,BIN 00010100,BIN 10100000
70 DATA BIN 00010011,BIN 00100000,
  BIN 00100000,BIN 00010000,BIN 00100000
  BIN 00010000
80 REM character in figure 2
90 FOR i=USR "d" TO USR "d"+3
100 READ n: POKE i,n
110 NEXT i
120 DATA BIN 00001000,BIN 01000000,
   BIN 00001000,BIN 01000000
```

since the routine and the user-graphics are safe above RAMtop — and enter the program in listing 5. This will make a row of seven multicoloured space invaders walk across and down the screen in the manner so familar to all devotees of the arcade game. Note that all seven invaders can be erased with one call to the routine when moving down a line by setting Mode to 0, Width to 140 and HT to 11 — lines 130-160.

Other sections of the program are as follows: lines 300-340 print the row of seven characters in the seven different Ink colours. Lines 200-260 call the subroutine at line 300 to print first the row of space invaders at a certain position and then overprints their legs with the character in figure 2.

Lines 100-170 make the invaders move first left to right across the screen, and then walk back in the reverse direction. Lines 20-60 make the invaders move down the screen after walking across it.

Fast graphics

From this example, you should be able to see how the routine can be used to advantage in your own programs, producing spectacular, fast-action graphics.

Finally, should you find that the user-defined graphics area is not large enough to store the number or size of characters that you wish to print with this routine, you can relocate the routine and use a larger area of RAM for character storage.

This can be done very easily since the machine-code routine can be put anywhere, provided that its first byte, that is, XPOS, comes immediately after RAMtop. For example, if you wanted to use the routine to generate 40 characters per line printing, you would need to define your own six-by-eight character set, or copy the Sinclair one, missing out the left and right hand margins which give spaces between the letters. This would require a large area of memory — about 800 bytes — for storage, and so 48K owners would need to relocate the routine at, say, address 64000 by issuing a command

CLEAR 63999

and then loading with

LOAD "animate" CODE 64000

The user-defined graphics area can now be moved to start at address 64300 by Poking system variable UDG — location 23675/6 — accordingly. This gives ample space for an alternative character set or for any other user-graphics. ■

THE DRAGON DUNGEON

TAKE INVENTORY!

You've tried N,S,E and W and failed to find the particular treasure of your quest. Now is the time to "take inventory" at the Dragon Dungeon.

The Dungeon vaults are filled with peripherals, books, software and other goodies, exclusively for the Dragon 32 owner — from recorder leads to Editor/Assemblers and from arcade games to Data Base Management Systems.

Our stock of software is selective, since we believe in value-for-money. Feed your Dragon on the best programs! Current best-seller: Salamander's superb 'Dragon Trek' (£9.95).

We try to stock everything published on the Dragon. Try the 'Dragon Companion' (£4.95) and discover 12 graphics modes! Current best-seller: David Lawrence's 'The Working Dragon 32' (£5.95).

'Textstar', which stores six pages of A4 per loading, now in stock (£12.95).

Send for current listings.



DRAGON STICKS

Top quality double-potentiometer joysticks, for the Dragon owner who demands arcade action. Sensitive, but tough and reliable, Dragon Sticks will keep on zapping when others fail! £19.95 per pair, inclusive VAT and postage.



DRAGON'S TEETH

The Dragon Owner's Club monthly newsletter is packed with news, reviews and information for the dedicated Dragon-basher. The Dungeon Master is collecting all your tips, discoveries, reviews and "beefs" and will send out guidelines *and payment rates to those of you* who feel like breaking into print!

'Dragon's Teeth', which is published in the last week of every month, includes hardware and software offers, Club members adverts and local Dragon user-group news. Badges, T-shirts, Dragon sweaters and similar for extrovert owners!

Annual Membership (including 'Dragon's Teeth') £6.00 six-month trial subscription £3.25.

THE DRAGON DUNGEON
P.O. Box 4, Ashbourne, Derbys. DE6 1AQ. Tel: Ashbourne 44626

THE PROFESSIONAL APPROACH TO

SPECTRUM

SOFTWARE

We are a well established software company expanding into the field of Personal Computing.

ENHANCE YOUR BASIC

Now available BASIC toolkit includes:

- Add logical arithmetic functions (AND, NOT, OR, XOR)
- List all BASIC variables and arrays
- Speed up your games with our fast screen output.
- Renumber your program (including GOTO and GOSUB)
- All routines in machine code
- Easily called from BASIC
- Fully documented
- Runs on 16K and 48K SPECTRUM

£9.95 inc VAT (+ £1 p. & p.)

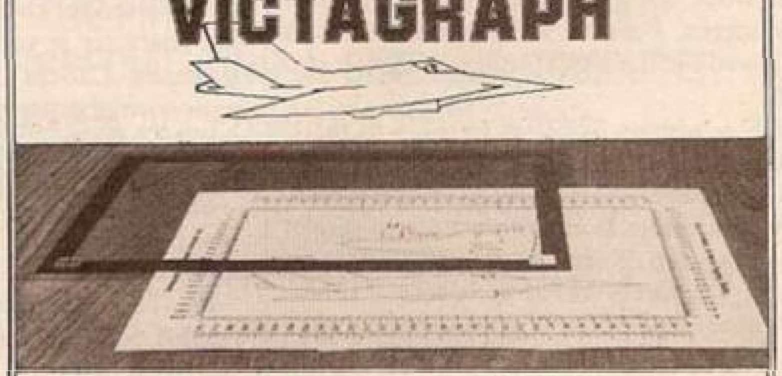
To order or to obtain details of our other products contact:

Malva Ltd.

70 ASHCHURCH DR.
WOLLATON
NOTTINGHAM
NG8 2RA

REAL TIME SOFTWARE SPECIALISTS

VICTAGRAPH



PLOT WINDOW

Now supplied with offset calibrated window especially designed for

ZX SPECTRUM

place your drawing etc. in the Victagraph and you are ready to plot and draw, using the movable window mask and offset co-ordinate window.
With easy to ead scale and EASY FINDER to help with negative and zero numbers.
Combine PLOT, DRAW and CIRCLE to advantage with Victagraph-Plot Window.

UK only
Total price ZX Sectrum £7.50 — Atari 4/800, Dragon 32 £7.00
Please state WHICH — Cheque/P.O. to Victa Ceramics. Tel: 08894 2426

VICTA CERAMICS (YC)
6A BOW STREET, RUGELEY, STAFFS. WS15 2BT.

COMPLEX SOUNDS

From laser explosions to ducks quacking, Ronald Seniscal's complex sound generator provides the special effects — without interrupting your games program and without special circuitry.

THIS PROGRAM produces a variety of sounds at the same time as executing instructions of a program completely separate from it. It is self-contained, so that a program written with it can run on any 48K Spectrum.

To do this I used the Z-80 interrupt mode 2. First of all, prepare a tape ready to record the program on, and then type in the listing in figure 1. This is the editor which creates the sounds used in a program. There is an extra line to be inserted in the program missing from the listing printed. It is:

755 SAVE "Specsound" CODE 65002,271 : PAUSE 50

It is important that you check your typing against the listing again when you have finished, to make sure there are no Poke errors, which could crash the program. Do not run the program at this stage, as it contains calls to a machine-code routine you have not yet put in. When you are satisfied with your typing save a copy of the program by typing in

SAVE "Specsound 2" LINE 1

and Verify it. Leave the tape in position after Verifying.

Now clear the machine by typing

PRINT USR 0

and input the listing in figure 2. Again when you have finished, check each number against the listing.

Now Run the program. The location and contents of the addresses Poked into will be scrolled up the screen. When it is finished, before Saving it, look at location 65271 on the left and check that it holds the number 251. If there is anything other than that there, you have probably put an extra number in the Data statements, or left one out. Go back and check it again.

Now press a key to save this code straight after the Basic editor. You have now finished the entire program. After doing that, use as a command

PAUSE 50:PRINT USR 65002

One second later, the number nine should appear and there will be a slight clicking noise. If anything else happens, there is an error.

Clear the machine again — after verifying the code — and load the entire program in from the beginning. The second part will be automatically loaded after the first, and then it will auto-run.

You will see nine numbers, with their names, and a cursor. The cursor is moved by the up and down cursor keys. While the cursor is pointing to a number, that number can be changed. This is done by pressing the left cursor to decrement, and the right cursor to increment. To change more quickly use the 4 key to decrease by 10 and 9 to increase by 10. You cannot go beyond the values 0-255, and the program protects against this.

These numbers actually form a part of the machine code and it is by changing these that you change the sound. To hear a sound at any time, press P. You can do this while another sound is still being put out without danger of crashing.

Now the names to which the numbers are related. First is the starting point. If you think of a complete sound as having a value of 255, changing it to 127 would mean that you would hear it from halfway through compared to the first version.

Second is speed. 0 is the fastest here, and higher values mean the same sound is produced, but more drawn out.

The next four values act against each other inside the routine. The first two control the length and frequency of the click being produced, and the second the gap between the clicks. To find out more about these, experiment with them, but the second number of each pair is usually set to 255. To avoid doing this manually, press T.

The next two should be set either to 1 or 0 as anything over 1 will be taken to mean 1. The first one, if set to 0, causes the pitch to rise. Setting this to 1 does the opposite. The second variable does the same for the silences between the clicks.

The last variable determines the actual quality of the sound, as balanced against the speed penalty. A program requiring high-quality sound will run more slowly than one which is not as critical. Setting 1 is awful, and should not be used; 6 is highest and sounds like a custom-built generator but runs at only 10 percent of normal speed so should only be used in machine-code programs. A useful compromise is 2. Anything over 6 is for special effects. Try it and see.

Technically this number is used as the high byte of a number which is decreased by one when a sound or gap is put out, returning when zero, so six times 256+255 or 1,791 clicks can be put out every interrupt. This is

(continued on page 119)

Figure 1. The sound editor.

```
   1 REM  data for interrupt sou
nd driver
  10 CLEAR 64980
  25 POKE 23692,255
  30 FOR a=65002 TO 65273
  40 READ z: POKE a,z: PRINT a,P
EEK a: NEXT a
  45 SAVE "Specsound"CODE 65002,
271
  60 DATA 58,162,254,60,33,247,9
0,1,9
  70 DATA 0,9,61,32,252,195,174,
254,0,0
  80 DATA 0,0,3,254,0,0,245,197,
213,229
  90 DATA 205,191,2,42,165,254,1
24,181,40,24
 100 DATA 229,33,255,2,58,167,25
4,71,58,169
 110 DATA 254,87,58,47,254,95,58
,168,254,14
 120 DATA 254,201,0,0,33,255,2,1
4,254,30
 130 DATA 14,22,1,123,246,0,230,
255,253,203
 140 DATA 71,70,40,1,47,71,58,72
,92,203
 150 DATA 63,203,63,203,63,246,2
4,237,121,45
 160 DATA 204,132,254,16,248,123
,246,0,230,255
 170 DATA 253,203,71,78,40,1,47,
71,58,72
 180 DATA 92,203,63,203,63,203,6
3,237,121,45
 190 DATA 204,132,254,16,248,21,
32,191,29,32
 200 DATA 186,235,34,165,254,225
,209,193,241,237
 210 DATA 86,251,201,0,0,37,192,
225,34,165
 220 DATA 254,50,168,254,120,50,
167,254,122,50
 230 DATA 169,254,123,50,47,254,
225,209,193,241
 240 DATA 251,237,77,0,0,0,0,0,0
,0
 250 DATA 10,31,1,0,0,0,0,243,25
3,54
 260 DATA 71,0,126,60,50,47,254,
35,126,60
 270 DATA 50,49,254,35,126,50,52
,254,35,126
 280 DATA 50,54,254,35,126,50,84
,254,35,126
 290 DATA 50,86,254,35,126,183,4
0,4,253,203
 300 DATA 71,198,35,126,183,40,4
,253,203,71
 310 DATA 206,35,126,183,32,2,62
,5,50,20
 320 DATA 254,50,43,254,62,253,2
37,71,237,94
 330 DATA 251,201,0
```

AMSOFT

OPERATING AND CONTROL SYSTEMS FOR DISCERNING ZX81 AND SPECTRUM USERS

All **AMSOFT** products are designed to help users get the most out of their machines. No additional hardwae is needed to run them, but they can support other devices if needed.

AM-ZXFILE allows you to use large cassette data files in BASIC programs, with no limit on file size, and input/output in the same program, like a big machine. For ZX81 at £4.00, and Spectrum at £5.00.

AM-ZXMON is the operating system which allows you to develop, edit, run, and checkpoint machine code programs, and to create and use libraries of machine code routines on tape, saving hours of work.

ZX81 version £6.00, and Spectrum version £7.00.

Under the control of **AM-ZXMON** you can run **AM-ZXEDIT**, a text editor for creating and editing assembly language source code, for input to **AMAZON**, a full assembler which creates machine code tape files. User symbols, hex., decimal, and string constants, and saving/re-use of symbol tables are among the features.

AM-ZXEDIT for **ZX81** and Spectrum £4.00. **AMAZON** for ZX81 £8.00, available for Spectrum late April at £8.50.

NEW! **AM-ZXSP** takes a saved **ZX81** program tape and loads it into a SPECTRUM leaving it ready to run, edit or save. No more retyping of programs when you change machines. Available now at £6.50.

All our prices include VAT.

AMERSHAM SOFTWARE LTD.
Long Roof, Hervines Rd.,
Amersham, Bucks. HP6 5HS
(02403) 6231

OAKLEAF COMPUTERS LTD

Education Hobbyist & Small Business Computers

BBC

Model B	**£399.00***
100K Single Disk	**£265.00***
100K Twin Disk	**£389.00***

OAKTREE WORKSTATION
Teak £24.95 **white £22.95**
ELECTRON — PHONE FOR DETAIL

Acorn Atom & BBC Twin User Joystick Interfaces £13.95
(Free Carriage — Please state model)
All Prices include V.A.T. *£8.00 Carriage

BBC SOFTWARE & ASSESSORIES

ALL IN STOCK

NETWORKING & EDUCATION SPECIALISTS

Please send your remittance to:— **121 DUDLEY ROAD, GRANTHAM, LINCS NG31 9AD Tel: (0476) 76994.**

ACORN SPECIALISTS

SOFTWARE

for ZX-81, ZX Spectrum BBC Micro

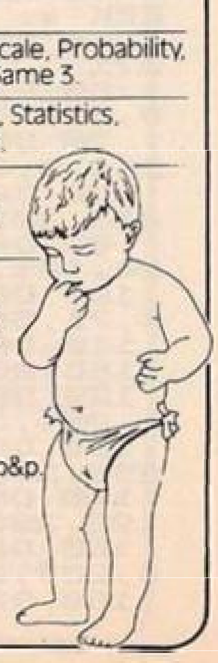
50 New maths programs — improve your maths and programming skills by playing Simon maths **Games.**

Choose your own level of difficulty — suit ages 10-16.

10 programs on each tape — most incorporate **Moving Graphics** and are fun to run.

Let your computer help you to pass your exams.

Maths 1	Number, Area, Fractions, Decimals, Money, Length, Number, Estimation, Test 1, Game 1.
Maths 2	Volume, Ratio, Percentages, Perimeter, Bases, Time, Number, Estimation, Test 2, Game 2.
Maths 3	Directed Number, Co-ordinates, Angles, Scale, Probability, Density, Temperature, Estimation, Test 3, Game 3.
Maths 4	Square Roots, Indices, Circles, Inequalities, Statistics, Number, Fractions, Angles, Test 4, Game 4.
Maths 5	Equations, Directed Number, Statistics, Probability, Circles, Equations, Pythagoras, Simultaneous Equations, Test 5, Game 5.



Simon Software

Quality tapes copied at normal speed for better reproduction.
Cassettes with 10 programs, full instructions and Printed Programs £6 (inc. VAT). Please add £1p&p.
FREE! blank tape with each **set** ordered.
Send cheque/PO to: Simon Software, Dept. E.S. (or Requisition Order). Freepost, New End, Redditch, Worcestershire B96 6NE.
(Please state ZX-81 (1K), (16K) or BBC Micro) or **ZX Spectrum.**

(continued from page 117)

why everything slows down so much when using this number in the length of interrupt variable. 0 is not really useful so the routine sets it to 5.

Of course, one sound is not much good on its own, so room has been made for 28 of them. The red number in the top left of the screen is the field number — 0 to 27 — and is changed by pressing C and then the number of the field you want to work on. A field is unchanged when you are not actually working on it, so you can go back to it at any time. Pressing M moves one field to another. Give the startfield and the destination; the field will be copied and the one put on the screen for you to work on will be the new copy.

To make more copies of this program use Goto 1000. Both parts of the routine will be automatically Saved. Dot not use any Print commands, as the numbers are stored in the printer buffer.

It is recommended that you play around with this routine for a while before actually incorporating any sounds into a program of your own. When you are ready to do this, use the following as guidelines.

Calculate how many sounds you want in a program, and write down the number — starting at 0 — and a description of the sound, that is, what it is meant to represent. Write your game with this in mind.

Inside your program, when you want a sound to be produced at a particular point, just Poke the field number into 65186 and then use the instruction LET sd = USR 65002

While writing these put a Rem in front of them so that if you accidentally Run it, it will not try and execute these instructions. Remember to remove them when the machine-code routine is in place. At the start of your program put these commands

```
CLEAR 64980: LOAD "Specsound" CODE:
LOAD "" CODE
```

and then Save the program, keeping the tape positioned after the item you have just saved.

Load the editor and create the sounds you want as shown above. When you have finished, press S and then the first field number you want Saving, then the last and finally the name. The machine-code routine will then be copied on to tape, followed by the sounds, and that is all there is to it.

It is possible to Save and Load before a sound has finished. The sound will stop for the duration of these commands, but resume where it left off afterwards. List and Edit can all be performed during sound production. To stop a sound, select a field which is blank and make it produce that sound ■

Figure 2.

```
   1 REM This program is
       © R Seniscal 1982
   2 RESTORE : CLEAR 64980
   3 BORDER 0: PAPER 0: INK 7: C
LS
   4 PRINT INK 6;"wait a moment"
   5 LOAD "Specsound"CODE
   6 REM run 10 if stopped
  10 BORDER 7: PAPER 7: INK 0: C
LS : POKE 65186,0
  12 DIM a(9)
  15 LET pres=23295: LET se=0: L
ET b=12
  16 FOR z=1 TO 9: READ x: LET a
(z)=x: NEXT z
  17 DATA 5,6,8,9,11,12,14,15,17
  19 PRINT INK 4;"↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑
↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑"
  20 PRINT INK 1;TAB 6;"Spectrum
 sound fx"
  30 PRINT INK 2;TAB 6;"© RS 25/
26.12.1982"
  45 PRINT INK 4;"↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑
↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑"
  47 PRINT
  50 PRINT TAB b;"starting point
"
  60 PRINT TAB b;"speed"
  65 PRINT
  70 PRINT TAB b;"lowest pitch (
1)"
  80 PRINT TAB b;"highest pitch
(1)"
  85 PRINT
  90 PRINT TAB b;"lowest pitch (
2)"
 100 PRINT TAB b;"highest pitch
(2)"
 110 PRINT
 120 PRINT TAB b;"reverse (1)"
 130 PRINT TAB b;"reverse (2)"
 135 PRINT
 140 PRINT TAB b;"length of inte
rrupt"
 150 PRINT INK 2;TAB b;"(if 0 th
en length=5)"
 160 PRINT
 170 PRINT TAB 3; INK 7; PAPER 3
;" press ""p"" to hear sound "
 190 PRINT AT 5,0;"    ": PRINT A
T 5,0; INK 2;se;":"
 200 FOR a=1 TO 9: PRINT AT a(a)
,6-(LEN STR$ (PEEK (pres+a))); I
NK 1;PEEK (pres+a)
 210 NEXT a
 230 LET pos=1
 240 IF INKEY$="7" AND pos>=2 TH
EN LET pos=pos-1
 250 IF INKEY$="6" AND pos<=8 TH
EN LET pos=pos+1
 255 FOR z=1 TO 9: PRINT AT a(z)
,7;"  ": NEXT z
 260 PRINT AT a(pos),7; INK 4;"<
"; INK 2;"--"; INK 1;">"
 270 IF INKEY$="" THEN GO TO 270
 280 IF INKEY$="p" OR INKEY$="P"
 THEN LET l=USR 65002
 290 IF INKEY$="c" OR INKEY$="C"
 THEN GO TO 600
 295 IF INKEY$="s" OR INKEY$="S"
 THEN GO TO 700
 300 LET pe=pos+pres
 310 IF INKEY$="9" AND PEEK pe<=
245 THEN POKE pe,(PEEK pe)+10
 320 IF INKEY$="4" AND PEEK pe>=
10 THEN POKE pe,(PEEK pe)-10
 330 IF INKEY$="8" AND PEEK pe<=
254 THEN POKE pe,(PEEK pe)+1
 340 IF INKEY$="5" AND PEEK pe>=
1 THEN POKE pe,(PEEK pe)-1
 350 IF INKEY$="t" OR INKEY$="T"
 THEN BEEP .5,1: POKE (pres+4),2
55: POKE (pres+6),255: GO TO 190
 360 IF INKEY$="m" OR INKEY$="M"
 THEN GO TO 800
 480 REM
 490 PRINT AT a(pos),3;"    ";: P
RINT AT a(pos),6-(LEN STR$ (PEEK
 pe)); INK 1;PEEK pe
 500 GO TO 240
 600 INPUT PAPER 2; INK 7;" numb
er? ";se
 605 IF se>27 THEN GO TO 600
 610 LET pres=9*se+23295
 620 FOR a=1 TO 9: PRINT AT a(a)
,3;"    ": NEXT a
 625 POKE 65186,se
 630 GO TO 190
 700 REM
 710 INPUT PAPER 4; INK 7;"From
which number (inc.)?";from
 720 INPUT PAPER 3; INK 7;"To wh
ich number (inc.)?";to
 730 LET start=23296+9*from: LET
 to=(to-from)*9+9
 740 INPUT "name?";t$
 750 IF t$="" OR LEN t$>10 THEN
GO TO 740
 760 SAVE t$CODE start,to
 770 GO TO 190
 800 REM move
 810 INPUT INK 2;"move from? ";s
ta:
 820 IF sta<0 OR sta>27 THEN GO
TO 810
 830 INPUT INK 2;"move to? ";sta
2:
 840 IF sta2<0 OR sta2>27 THEN G
O TO 610
 850 IF sta=sta2 THEN BEEP 1,-10
: GO TO 810
 855 LET se=sta2
 860 LET sta=23296+sta*9
 870 LET sta2=23296+sta2*9
 880 FOR z=0 TO 8: POKE (sta2+z)
,PEEK (sta+z): NEXT z
 890 BEEP .6,-20
 895 GO TO 610
 999 REM
1000 CLEAR : BEEP 1,-10: BEEP 1,
-20: SAVE "Spexsound2" LINE 1: S
AVE "Specsound"CODE 65002,280
```

hi-tech Presents a Range of Software for
THE JUPITER ACE (3K)

£6.50 EACH
INC POST/PACKING



MICRO MAZE
Four levels of Smill automatically increase + a choice of 3 different mazes in this ever popular game. Eat the Dots, Score Points before the two alians get you! Full Sound.

ACE INVADERS
YES! your favorite arcade game for the Jupiter Ace. 2 Speeds, Musical Sound, Nice Graphics.

MEMORY STARS
An exciting memory game, 5 levels of Play, Musical Sound. Inkey your micro in the right sequence to win.

SPACE BATTLE
Fly in and out of the Alian Saulers beat them off with your Stun Ray. 2 speeds. Sound.

CAVERN ATTACK
Guide your Neclear Sub deep down into the cavern. Hit the torpedoe spitting monsters. 2 speeds. Very challenging game. Sound.

GREEN X FROG
Guide your Frogs across the road 10 points for every frog across. 2 Speeds, Sound, a very challanging game.

STOP PRESS . . . An exciting range of 16K games and toolkits . . . Coming soon . . . Phone now for details of availability.

Available direct from us or from selected Spectrum (UK Ltd) Dealers now ************

WANTED: Good programs for all makes of micros. Good commission paid send copy + SAE for quick evaluation ************

Trade/Export enquiries welcome phone for details

hi-tech microsoft
FREEPOST
DOVER
KENT
Tel: 0304 821495.

Cheques/PO payable to HI TECH MICROSOFT

Please send me

- ☐ MEMORY STARS
- ☐ ACE INVADERS
- ☐ CAVERN ATTACK
- ☐ SPACE BATTLE
- ☐ MICRO MAZE
- ☐ GREEN X FROG

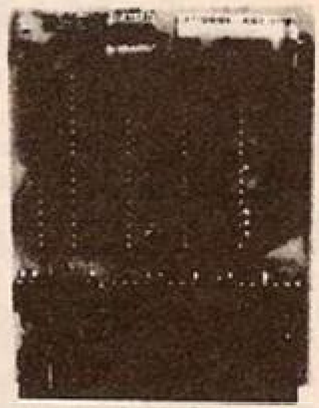
NAME. . . . .
ADDRESS . . . .
. . . .

PRICE BREAK-THROUGH ON EXTRA MEMORY FOR ZX81 !

The NEW EconoTech 16K RAM PACK

adds 16-times more memory to your ZX81 at a budget price!

Fully assembled, tested and guaranteed - neat and compact. fits snugly to eliminate wobble. Compatable with ZX Printer.



ONLY £19.95 !
plus £1.50 post & packing to anywhere in the world

Full refund if not fully satisfied - simply return within 14 days of purchase. Allow up to 28 days for delivery. Fill in the coupon below and send with cheque or P.O.

To:
EconoTech, 30 Brockenhurst Way, London SW16 4UD
Please send me .... 16K RAM Packs @ £19.95 each, plus £1.50 post and packing.

Name . . . .
Address . . . .
. . . .
. . . .

reprints

If you are interested in a particular article/special feature or advertisement in this journal

HAVE A GOOD LOOK AT OUR REPRINT SERVICE!

We offer an excellent, reasonably priced service working to your own specifications to produce a valuable and prestigeous addition to your promotional material. (Minimum order 250 copies). Telephone Michael Rogers on 01-661 3036 or complete and return the form below.

To: Michael Rogers, Your Computer, Reprint Department, Quadrant House, Sutton, Surrey SM2 5AS.

I am interested in . . . . copies of article/advert.

headed . . . . featured in this

journal on pages . . . . , issue dated . . . .

Please send me full details of your reprint service by return of post.

Name . . . .

Company . . . .

Address . . . .

. . . . Tel No . . . .

SPECTRUM

24 LINE INPUT/OUTPUT PORT (motherboard not required)	£18.95
MOTHERBOARD — SIX SLOTS	£26.50
MOTHERBOARD PCB ONLY	£ 6.50
SPECTRUM 28 WAY CONNECTOR	£ 3.25
MALE CONNECTOR	£ 1.90
34 WAY RIBBON CABLE	per metre £ 1.80

ZX81

40 KEY KEYBOARD	£20.00
SPARE KEYS	each £ 0.25
MOTHERBOARD — TWO SLOTS	£15.00
24 LINE INPUT/OUTPUT PORT	£18.95
16K RAM PACK	£25.00
MUSIC BOARD	£18.95
23 WAY FEMALE CONNECTOR	£ 2.50
MALE CONNECTOR	£ 1.60
24 WAY RIBBON CABLE	per metre £ 1.40
GETTING ACQUAINTED WITH YOUR ZX81	£ 4.95
PROGRAMMING FOR REAL APPLICATIONS	£ 6.95
REAL APPLICATIONS TAPE	£11.44
MASTERING MACHINE CODE	£ 7.50

Prices are for built items. Postage 40p under £4.00. Export postage (surface) £1.80. Send SAE for full catalogue. Cash with order or ACCESS

DEPT. YC3

REDDITCH ELECTRONICS

21 FERNEY HILL AVENUE, REDDITCH WORCS B97 4RU

FABULOUS!

SPECTRUM ZX ADD-ON OFFER

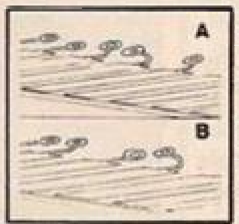
from 16k to 48k or 80k

With our ME48 and ME80 memory expansion add-ons your ZX Spectrum can increase its capability by up to five times.

★ No soldering ★ easy to fit ★ simply plug in ★ fully guaranteed ★ no loss of memory through wobble or white out.



NB. Before ordering your Spectrum add-on please check which Spectrum you have in your possession. The diagram below clearly indicates the different specifications between the series A and B.



At the back of the ZX Spectrum, the metallic contact strips can be clearly viewed. In the series A the space separating the strips is the same width as the strips. In the series B the strips are twice as wide as the space between.

ME48 Series A £34.50
Series B £24.50

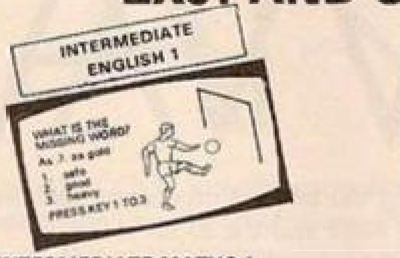
ME80 Series A £49.50
Series B £49.50

Please tick the appropriate box to order your Computer Add-on. ME48 Series A ☐ Series B ☐
ME80 Series A ☐ Series B ☐ I enclose a cheque or postal order for
made payable/crossed to Computer Add-ons, or I would like to pay by Access
or Barclaycard and I enter my number accordingly. *Allow 28 days for delivery
Name
Occupation
Address
YC1

COMPUTER ADD-ONS
7-9 Thane Works, Thane Villas London N7

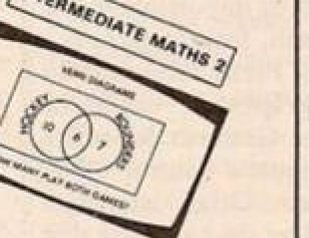
COMPUTER ADD ONS
7-9 Thane Works, Thane Villas London N7

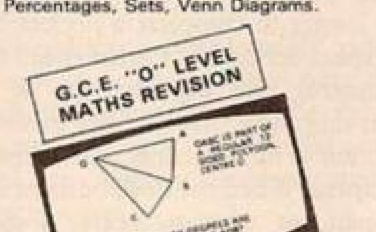
EDUCATIONAL SOFTWARE ZX81 AND SPECTRUM



INTERMEDIATE ENGLISH 1
(ZX81 and 16K SPECTRUM):—
Meanings 1, Meanings 2, Parts of Speech, Proverbs, Similes, Anagrams.
INTERMEDIATE ENGLISH 2
(ZX81 and 16K SPECTRUM):—
Idioms, Opposites 1, Opposites 2, Group Terms, Odd Word Out, Spellings.

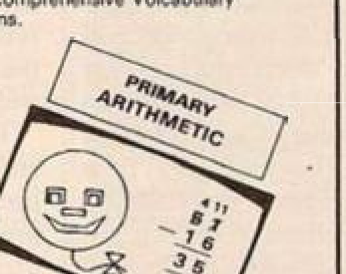
INTERMEDIATE MATHS 1
(ZX81 and 48K SPECTRUM):—
Long Multiplication, Long Division, Highest Common Factor, Lowest Common Multiple, Fractions 1 (+ & −), Fractions 2 (× & ÷).
INTERMEDIATE MATHS 2
(ZX81 and 48K SPECTRUM):—
Areas, Perimeters, Simple Equations, Percentages, Sets, Venn Diagrams.





"O" LEVEL MATHS REVISION
(ZX81):—
1 teach and test program, plus two programs using generated questions from the "O" level syllabus.
"O" LEVEL FRENCH REVISION
(ZX81):—
3 teach and test Grammar programs, plus 3 comprehensive Volcabulary programs.

PRIMARY ARTHMETIC
(ZX81 and 16K SPECTRUM):—
Add, Subtract, Multiply and Divide. Numbers are in large size type. Entry of answer with units first.
EDUCATIONAL QUIZ
(ZX81):—
4 programs for the family. Questions on General Knowledge, Reasoning, English and Maths. All questions use RND functions.



£4.50 per cassette or send sae for catalogue to:—

ROSE CASSETTES,
148 Widney Lane, Solihull, West Midlands B91 3LH.

Programmers: We are looking for good ZX educational software.

H&H SOFTWARE

For the BBC Computer A or B

EARLY ONE

an educational game for early readers for £6.50



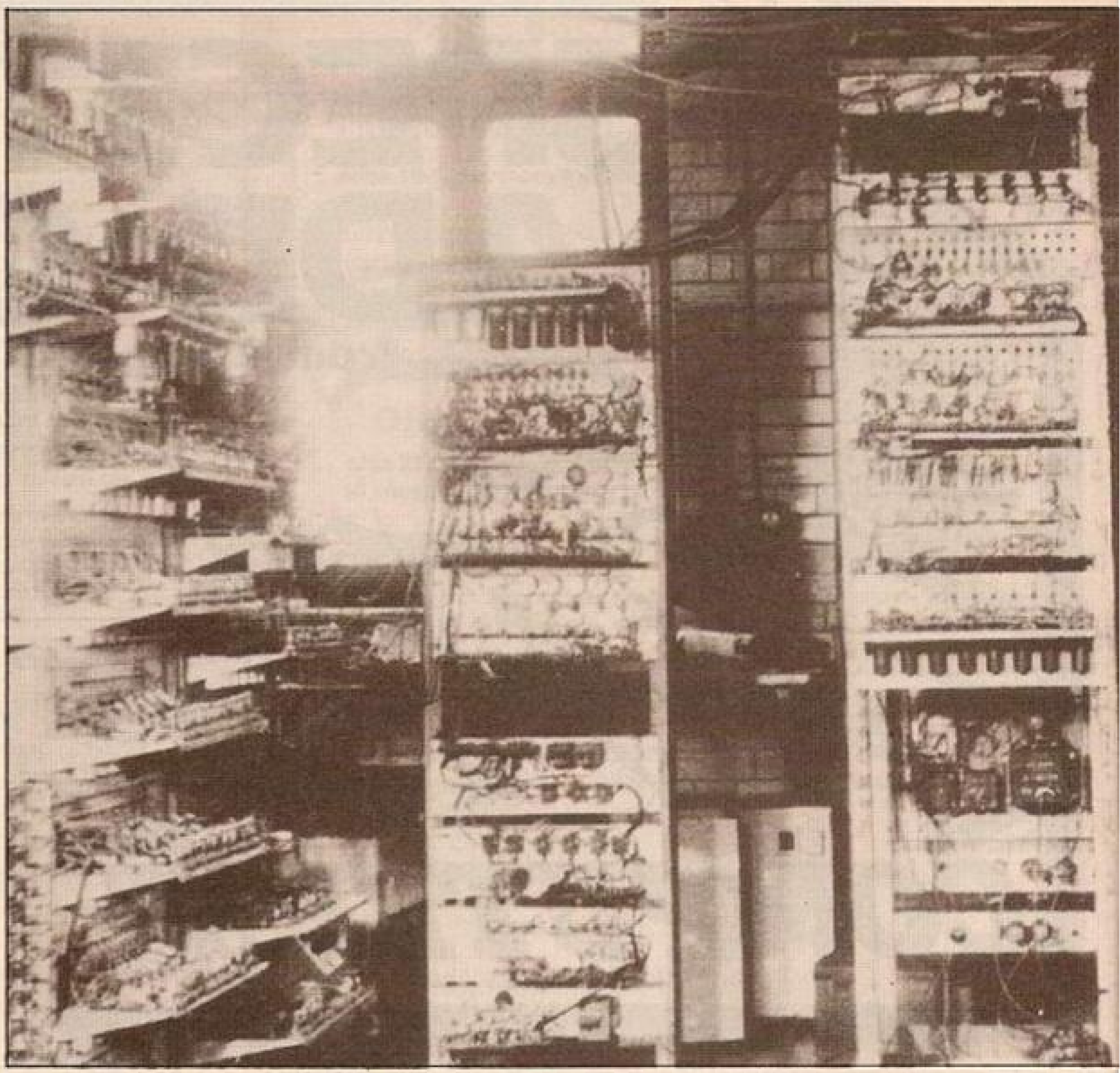
. . . be early — get the worm not the bird

Send S.A.E. for a catalogue of our other educational games and useful programs for the BBC and Dragon Computers.

Please send orders and cheques/PO/Transcash (No 614 131 1707) to:

H & H, Dept A, 53 Holloway, Runcorn, Cheshire.

John Dawson looks back at the days when every byte mattered, in his history of software.



SOFTWAR

THE EFFORT required to write software has been a matter of concern since 1946. At that time, M V Wilkes built EDSAC — Electronic Delay Storage Automatic Computer — with a team of helpers at Cambridge University primarily to permit program development. After 1949 this work concentrated on the construction of a library of mathematical subroutines. Wilkes said that "there would be almost as much capital sunk in the library of subroutines as in the machine itself, and builders of new machines in the future might wish to make use of the same order code — machine-code operations — as an existing machine in order that the subroutines could be taken over without modification."

Like the first Manchester and Cambridge computers some early microcomputers had so little memory that hardware was used to start the machine from the first instruction. These front panels allowed the operator to load binary values into the accumulator and other registers. Switches were set to identify the address in the memory and the data which was to be placed at that address. The address switches were then incremented and the new data placed at the next location. By this laborious method it was possible to place a short program into the computer's memory.

In *Faster than Thought* — B V Bowden, Pitman 1953 — it is said "In previous machines the input to the machine had been directly to the cathode-ray tube store from a binary keyboard, and output had been by inspection of a cathode ray tube monitor. For this machine — the second 1949 computer — input and output routines were developed which enabled teleprinter equipment to be controlled by the machine."

This was a great gain in productivity. Remember that the original input looked like figure 1 and you will have no doubt that high-level languages are a great boon to any computer programmer.

At Manchester University, R A Brooker developed the Autocode system which was intended to be a simple, easy to learn programming system for scientific users. Autocode concealed much of the magnetic drum transfer details from users allowing them to concentrate more on the purpose of the program — the solution of a mathematical problem. Autocode provided floating point operations and standard instructions to take information into the machine from a punched paper tape, outputting the result to a teleprinter. Fortran — formula translation — often referred to as the grandaddy of high-level languages did not appear until 1956, two years after the introduction of the Autocode system.

All high-level computer languages translate the instructions that you or I can understand easily into a long series of machine-code instructions which appear to the computer as ones and zeroes. However different the high-level language looks, the translation produces the same machine code and the operation of the central processor unit is precisely the same.

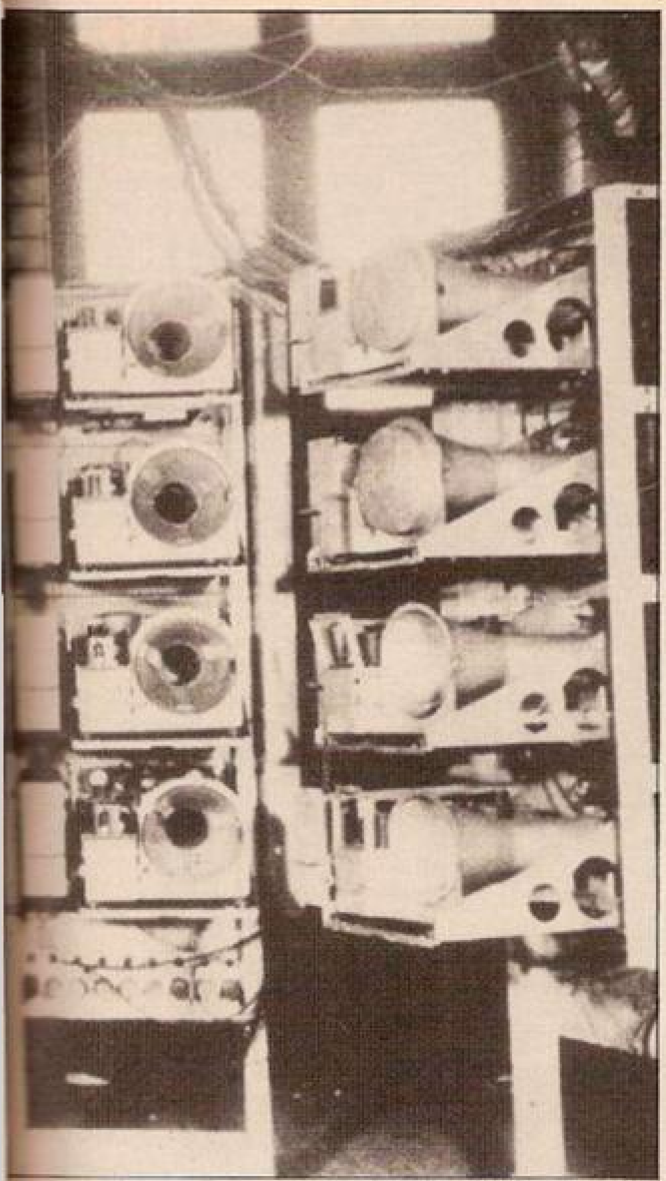
Why are there literally hundreds of high level languages? Some were written for special purposes and are difficult or impossible to use for anything else. Graforth, for example, is a special purpose version of Forth developed for drawing pictures and graphs. It would be almost impossible to use Graforth for office accounting or the continuous control of an industrial chemical plant. Other languages were cramped or limited by the hardware that they were designed for.

Lisp was made to work — or implemented — first on an IBM 704 and some of the instructions in the language take their names from registers inside the computer where the results were to be found — CAR and CDR for example — contents of the address part of register and contents of decrement part of register. You might reasonably have come to the conclusion by now that a great deal of software and many of the languages it is written in are primitive. This is correct.

It is true that the technical revolution has continued with the development of 16- and 32-bit microprocessors but it is also true that there is, at present, no significant software written specifically for these new CPUs and in the microcomputer world we are only beginning to scratch the surface of what can be done using old faithful processors such as the 6502, the 8085 and the Z-80.

The reason for the failure to advance at a comparable rate in software is merely that writing programs is labour intensive, difficult and very time consuming. Programs are written either by one person or by a team of programmers working to a common plan. Teams take longer to complete a project than you might expect because of the overhead time lost in managing the development of the program, making sure that various pieces fit and each section is built according to common design principles. When the development time runs into man, or woman, years, a single designer/programmer might never finish the task or might fail to appreciate some aspect of the program that will prevent it from ever working correctly.

The permutations of the various branches and choices that are made in any significant program are so numerous as to effectively prevent comprehensive testing. Remember that at a microcode level even the designers of the chips themselves make mistakes. The Z-80 CPU made by Zilog contains a number of unlisted instructions which were dropped from the final specification and may or may not work on the chip you possess.



E AND ALL THAT

The 6502 CPU actually contains a mistake in one of the listed instructions — JMP (xxFF) where the xx represents any page number, does not work correctly. If 'xxFF' is '50FF', for example, the instruction should obtain the address to jump to from 50FF and 5100. In fact, the 6502 chip uses the values in 50FF and 5000 to form an incorrect address combination.

Assemblers are used widely by programmers who need detailed control over the operation of the computer because the application they are working on is time critical or because they need to control sophisticated peripheral devices.

Forth was written by Charles Moore over a period of several years, although the language is dated formally as originating in 1969. Working at the National Radio Astronomy Observatory, Charles Moore wanted a new high level language to allow easy communication between the observatory instruments, the computer and the astronomer, the computer user. The IBM 1130 machine used in the observatory was a third generation computer and Charles Moore was so impressed with the results of his work that he called it a fourth generation language. The IBM 1130 permitted only five-character identifiers and the name was shortened to Forth — another good example of hardware dominance.

Forth is a threaded interpretive language — TIL — and this means that the program that you execute consists of a succession of calls to addresses of lower level instructions. Those instructions may, in turn, call other instructions at the same level or at a lower level until machine code instructions are reached.

Forth has given birth to a family of languages. Stoic is a CP/M version with some advantages, the source program takes up less space and CP/M files are fully supported, while BCPL — Basic Common Programming Language — is an austere TIL with a high degree of flexibility and little error checking. Program development tends to be faster than average using TILs because the nature of the language leads to a modular programming style which, in turn, allows easier debugging of sections of the program as you proceed.

The ease of descent into assembly language and the high level constructions such as If-Then-Else and Repeat-While often provided in TIL assemblers make Forth and its relatives suitable for on-line as opposed to batch processing. Programming in a TIL is a matter of extending the dictionary by building new words out of words that already exist and this, I believe, makes the language ideal for programming by people who are disabled. A microprocessor-based aid for a disabled person could be easily customised to suit the particular requirements of that person and could be altered from day to day by the owner.

Some people believe that as Forth becomes more popular so the need for assembly language programming will disappear. While it is true that Forth has a wide dynamic range — it allows you to move from a very high-level program to naked machine code entirely at will — there is a time penalty to be paid each time a new Forth word is executed. For words containing short sections of machine code the time overhead may be greater than the execution time for the actual operations that you wish to carry out.

A macro-assembler, on the other hand, bridges the gap between a straight assembler producing one machine-code instruction for each line of assembler code and high-level interpreters that will initiate several hundred machine code instructions for each line of the source program. A macro-assembler allows you to define a group of machine code instructions by a name. You may then use the name in your program as a single line and when the source code is assembled to produce an object program that will run on the computer all the instructions that were included in the group are inserted into the object program.

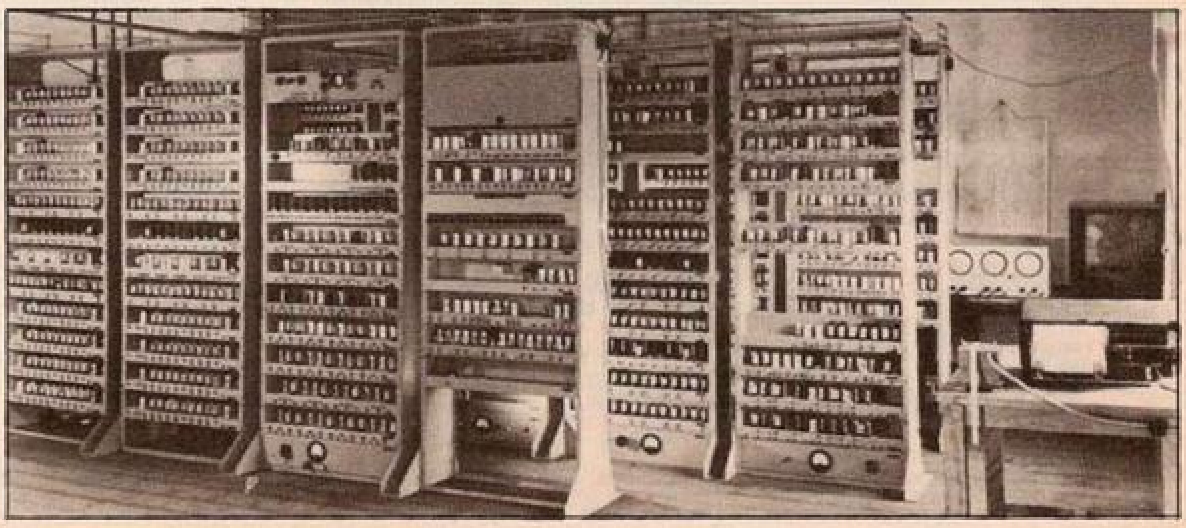
The advantages of this facility are immense. If you make a mistake in the method you use to multiply two numbers then you need only correct the instructions in the macro and wherever that macro-instruction is used in the program it will be put right when you re-assemble the program. A good macro-assembler will allow you to "nest" macro-instructions so that one macro can call another. This feature allows you to build higher and higher level macro-instructions.■

Figure 1.

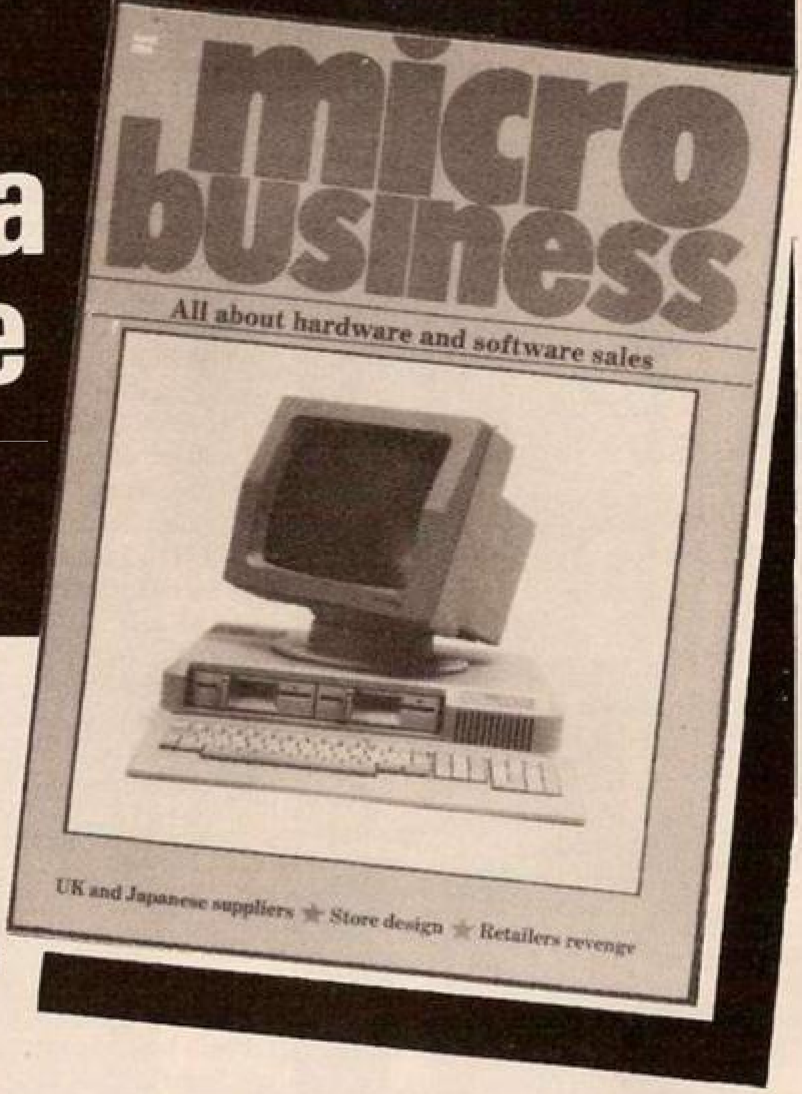
6502 CPU Instruction	**Binary representation**
Decrement Register X	1100 1010
Load Accumulator with Zero	1010 1001 0000 0000
Load Accumulator with 1	1010 1001 0000 0001
Load Accumulator with the contents of Address 1000 Hex.	1010 1101 0000 0000 0000 0001
Jump to Subroutine at 4040 Hex.	0010 0000 0000 0100 0000 0100

Expressed in hexadecimal notation the long strings of ones and zeros become more easily manageable — the instruction to decrement register X is expressed simply as CA.

Below: EDSAC in 1949. Above left: the Manchester Mark 1.



As from April there could be a *NEW* magazine in your life . . .



micro business

- Micro Business is designed to bridge the gap between those who are producing microcomputer hardware and software and those who are selling it.
- Micro Business is the magazine which makes sense of the micro scene, identifying the pitfalls and explaining the complexities of the microcomputer jungle.
- Micro Business is produced by the publishers of Practical Computing; Your Computer; Systems International; Computer Weekly; Electrical & Radio Trading and Electrical & Electronic Trader — Britain's leading journals in the computer and electrical retail markets.
- Micro Business will bring new hardware and software products to the attention of dealers and retail outlets throughout the UK.

That all adds up to an effective marketing and sales aid for companies producing microcomputer hardware and software. And an important source of market information for those at the sharp end — the retailers and dealers who are selling direct to the general public. If you fall into either of these categories please complete the coupon and return it to us, to obtain Micro Business free of charge.

To: Chris Hipwell, Publishing Director, Micro Business, Room 309H, Business Press International, Quadrant House, The Quadrant, Sutton, Surrey

I am professionally involved in the production and/or sale of microcomputer hardware and/or software products.

Please tick appropriate box(es)

☐ Please send me a reader application card so that I can register for free copies of Micro Business.

☐ Please send me your advertisement brochure as I am interested in advertising in Micro Business.

Name__________

Job Title__________

Company Name__________

Company Address__________

YC

"IT LOOKS NICE BUT WHAT THE HELL CAN I DO WITH IT?"

Every ZX SPECTRUM Print'n'Plotter Jotter has 100 pages of finely printed screen grids.

50 for the high resolution screen. 50 for the normal character screen.

With these at your disposal you can plan practically any graphics print-out to program into your computer.

The high-resolution PLOT grid shows every one of the 45,060 pixels! Every one printed. Every one with its co-ordinate numbers. This gives you enormous graphics power to DRAW, PLOT, CIRCLE, PLOT OVER and so on in any position or screen building up graphic drawings, charts, maps . . . in fact anything without the complications of guesswork, integer out of range, or wrongly positioned pixel colours which change PRINTed INK characters!

The normal character PRINT grids on the other hand will allow you to be specific about PRINT AT, TAB, PRINT OVER, SCREEN$ and INK / PAPER in direct co-ordination with PLOT . . . you see every page is printed on **high quality tracing paper** . . . ideal to overlay on to illustrations and 'copy' or co-ordinate.

And there's another bonus, because each page contains 24 User-definable grids — **2400 per pad!**

With 50 pages of PLOT grids, 50 pages at PRINT grids 2400 user-definable grids, a set of colour pens, a printed PIXEL RULER and our Special Offer of demo programs, IT'S THE BEST VALUE IN ZX GRAPHICS PROGRAMMING.



"PRINTER PAPER THAT WORKS? I DON'T BELIEVE IT!"

Five rolls of our PRINTER PAPER will only cost you £10.95. And you will gain a great deal more! It prints beautifully. It's not too thick. It's not too shiny. Print is black — not grey. It actually feeds through the machine! See for yourself. Only £10.95 for 5 rolls. Beware of expensive imitations!



"NOW WHICH KEY DO I PRESS TO SHOOT DOWN THE THING FROM MARS?"

Ever forgotten which key to press when playing a game? Do you suffer from a mind-boggling mass of programmed keys? Do you write programs that use different keys to perform various functions? If so, we have just the thing for your ZX SPECTRUM.

A pack of Print'n'Plotter Keyboard Overlays.

Just write the function or functions under each key you program and keep the overlay for the next time you play the game.
Of course there's lots of more uses you will find for our OVERLAYS, user defined characters, keyboard scanners, mathematical programs, business uses — to name just a few.

There's TEN OVERLAYS to a pack — so you can program with impunity! And they fit perfectly onto your standard ZX SPECTRUM KEYBOARD. Each OVERLAY is printed with the cursor movement key directions and there's room for program name etc.



"ZX81 GRAPHICS BETTER THAN SQUIGGLES AND BLOBS?"

Disappointed with ZX81 Graphics? Perhaps you haven't explored the vast possibilities.

Why not invest in a ZX81 JOTTER, FILM and our guide "ZX81 Graphics programming made easy"?

The JOTTER is a 100 page pad of PRINT grids and PLOT grids with all numbered co-ordinates. The FILM is a re-usable matt transparent polyester version of the grids which can be drawn-on and used again . . . Ideal for overlaying and copying.

The 24 page full colour guide will show you how to use the JOTTER and FILM to produce perfect low resolution graphics on your ZX81!

So stop squiggling. Get a set now!



"WHERE CAN I GET THEM?"

Post now or call at one of our retailers!
Post to Print 'n' Plotter Products, 19 Borough High St., London SE1 9SE.

Name: ....

Address: ....

....

.... Y

......ZX SPECTRUM JOTTER @ £9.95 each.
......ZX SPECTRUM KEYBOARD OVERLAYS @ £2.95 per pack
......ZX SPECTRUM DEMO CASSETTE @ 95p each.
......ZX81 JOTTER PADS @ £3.50 each.
......ZX81 FILMS @ £2.25 each.
......ZX81 "GRAPHICS PROGRAMMING GUIDE" @ £1.50 each.
......ZX PRINTER PAPER @ £10.95 per five rolls.

Remittance enclosed. Please bill my Access / Barclaycard / Visa / Mastercard No:

....

Please note: Price quoted include VAT, P&P for UK deliveries.
Overseas order please add 25% for additional Surface Mail.

Print'n'Plotter Products

You can see and buy most of our products at
W. H. Smith (Computer Stores)
Buffer Micro (Streatham)
Microware (Leicester)
Dennys Bookshops (London EC1)
Personal Computer Services (Darwen, Lancs)
Telford Electronics & Computing (Shifnall)
Georges Bookshop (Bristol)

Save money. Subscribe NOW!



Now's the time to subscribe to Your Computer, Britain's biggest selling home computer magazine. Because as from the April issue we will be increasing the price to keep pace with rising production costs.

Your Computer is fantastic value for money. The December issue consisted of 164 pages packed with computer and software reviews, a special games section with listings for all the major home computers, articles on writing programs yourself, three features just for ZX81 owners, and Response Frame — the page which answers your questions. All this, PLUS a free Flexidisc containing games for the ZX81, Vic 20 and Sinclair Spectrum. The price? Only 60p.

And that issue was typical of the value which Your Computer readers have come to expect. Rather than cutting down on editorial and on the lively presentation which makes Your Computer so readable we are dedicated to maintaining our editorial standards. But with production costs rising we can only maintain quality if we increase the price of the magazine.

We know you'll think it worth paying the little extra we'll be asking because Your Computer will still be unrivalled value for money. Meanwhile, a subscription taken out NOW at the old rate of only £8.00 for 12 issues will save you money throughout 1983 — and beyond!

Just fill in the coupon and return it to us with your cheque or postal order for £8.00 payable to IPC Business Press.

To: Subscription Manager, Your Computer, Business Press International, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH.

I wish to save money by taking out a subscription to Your Computer at the current rate of £8.00 for 12 issues. My cheque/postal order for £8.00 is attached.

Alternatively, please debit my Barclaycard/Access/Diners Club/American Express* account.

Signature ______________________

**Please delete as appropriate*

Please start my subscription with effect from the:

February 1983 issue ☐ (Please tick appropriate box)
March 1983 issue ☐
April 1983 issue ☐

Name ______________________

Address ______________________

This offer applies in the UK only

BASIC DICTIONARY

This dictionary, compiled by Tony Edwards, will explain the function of common Basic words as used in popular machines, enabling you to work out your own machine's equivalent. A useful complement to our recent series on Basic dialect translation.

TAN The function which returns the tangent of its argument. The argument is usually expressed in radians. A standard ANSI word.

TEXT The Apple II command or statement which changes from graphics mode to text mode.

THE The PDP-8E abbreviation for THEN.

THEN Part of the IF . . . . THEN statement which is used to indicate the next operation scheduled, once the IF condition is satisfied. A standard ANSI word.

TI The Commodore Pet abbreviation for TIME.

TIM Another common abbreviation for TIME.

TIME A command and function used to return the elapsed time in seconds from some reference point. Not to be confused with TIME$.

TIME$ A function which returns the actual time of day. Not to be confused with TIME.

**TI$** The Commodore Pet abbreviation for TIME$.

TO Part of the FOR . . . TO . . .STEP statement.

TOP A function used in BBC Micro Basic to return the address of the first free location after the end of the current program.

TRACE An Apple II command or statement which causes the computer to print out line numbers as each one is executed. It is normally used during debugging only.

TRACE OFF The command or statement which switches off the TRACE Command. See also NOTRACE.

TRACE ON A command or statement similar to TRACE.

TROFF A common abbreviation for TRACE OFF.

TRON A common abbreviation for TRACE ON.

TRUE A special function used on the BBC Micro which returns the logical true value (-1) when called.

U

USR A function which transfers control from a Basic program to a machine-code program resident elsewhere in the memory.

UNTIL Part of the REPEAT . . . . . UNTIL statement.

V

VAL A function which returns the numerical value of a number expressed as a string.

VLIN AT An Apple II statement which draws a vertical line at the specified column position. The arguments after VLIN designate the start and end points and the argument after the AT designates the column.

VPOS A function which returns the vertical position of the cursor. The screen top is numbered 0.

VTAB An Apple II command which specifies the line on which the next output will commence.

W

WAIT A command or statement which causes the computer to halt execution for a specified period of time.

WIDTH A command or statement used to pre-select the printer carriage or VDU screen width.

WRITE The Apple II command or statement used to output on to disc or cassette storage material.

Non-alphanumeric characters

As well as the use of reserved words, computers also use non-alphanumeric characters as operators or abbreviations. To conclude this dictionary these are listed — in no particular order.

" (quotes). The almost universal use of quotes is to delimit the range of a string. It is an ANSI standard operator. The Atom uses a single quote for this purpose.

, (comma) An ANSI standard operator used as a delimiter in lists. The TRS-80 uses it as an abbreviation for THEN and to separate otherwise ambiguous lists. Palo Alto Tiny Basic uses the comma to allow the placing of more than one statement on a line.

. (full stop) An operator used by the TRS-80 level.1 to identify abbreviated commands, statements and functions. It can be used in level 2 as the argument of a List or Edit command and in this case means "last line operated upon". It is also used as the decimal point.

; (semicolon) A standard ANSI operator which allows several output sections to be joined together on one line.

(. . .) (parenthesis) The operator used to determine the order in which operations are performed. The innermost pair of parentheses are performed first.

[. . .] (square brackets) In many computers square brackets are interchangeable with parenthesis. The BBC Micro uses square brackets as delimiters for assembler statements. A single left square bracket sometimes represents the exponentiation operator.

= (equals) The ANSI standard mathematical equal sign. It is also widely used as an assignment operator, sometimes with a preceding LET. Most computers also use it as a relational operator to compare numerical values or strings.

^ (caret) The standard ANSI symbol for the exponentiation operator.

↑ (up arrow) Another symbol sometimes used as the exponentiation sign.

< (less than) The standard ANSI symbol for "less than". Used when comparing to numeric values. Many computers can use this to compare strings and, in this case, each character in turn is compared from the left to assess alphabetic order. As each character is compared individually and the order is decided by the first non-identical character, the length of the string is not a factor. Can be used with a "+" to represent equal to or more than.

> (greater than) The standard ANSI symbol for "greater than". Used when comparing numerical values or strings. Can be used with a "=" to represent equal to or more than.

<> (not equal to) The standard ANSI symbol for "not equal to". Used when comparing numerical values or strings.

>< (not equal to) A symbol sometimes used instead of <>.

≤ (equal to or less than) An alternative to <= used on some computers.

≥ (equal to or greater than) An alternative to >= used on some computers.

≠ (not equal to) An alternative to <> used on some computers.

' (apostrophe) used on many computers as an abbreviation for REM. Used on the Atom to enclose strings and on the BBC Micro to produce new lines in PRINT or INPUT statements. Sometimes called a "single quote". ■

ZX81 AND SPECTRUM HARDWARE

ZX81 KEYBOARD

FULLY BUILT!

£28.95

- Full size keyboard
- Plug in — No soldering
- Full Repeat on all keys
- Single keys for RUBOUT, EDIT, FUNCTION and CURSORS
- Large space and newline keys
- 2 Shift keys.

We also are stockist for Redditch Electronics. See their Ad in this issue and Feb 83 page 86. Our prices are 10% less for all their products.

Metal case to hold our keyboard, RAM pack, ZX81, PSU and strong enough to put TV on top. £26.

Postage 40p under £4. Export (surface) £2.
Send SAE or 20p for catalogue.
Cash with order or ACCESS.

HARRIS & LOCKYER ASSOCIATES
33 Pedmore Close, Woodrow South, Redditch, Worcs B97 7XB

MORE MEMORY FOR YOUR JUPITER ACE

PACER 16K EXPANDABLE RAM

The uniquely expandable 16K Ram Pack, similar in concept to the 'ZX Panda' but for the incredible Jupiter Ace. Complete in attractive, solidly built, injection moulded case. For more power to faster FORTH . . . you need a Pacer for **ONLY £29·95**



16K EXPANSION MODULE

Increase your Pacer potential to 32K with the plug-in 16K Expansion Module for **ONLY £19·95**

AFDEC ELECTRONICS LTD
318 Kempshott Lane, Basingstoke
Hants RG22 5LT

I wish to order the following:

Quantity	Item	Amount
	Pacer 16K Expandable Ram @ £29·95 inc.	
	Pacer 16K Expansion Module @ £19·95 inc.	
	TOTAL	

All prices include VAT and post and packaging. All items include a full year guarantee. Products are stocked and usually despatched within 10 days. Overseas customers add £4 post and packing. Cheques/Postal Orders etc. should be made payable to AFDEC Electronics Ltd.

Name ____________

Address ____________

Spectre **ZX 81 16K** | **SPECTRUM 48K**

SERIOUS APPLICATION PROGRAMMES

ELECTRONICS £5.95

Ever built a digital electronic circuit that didn't work? Now this highly comprehensive design programme enables you to draw a circuit diagram on the screen, using standard components, including transistors, logic gates, diacs, triacs, thyristors etc etc. (57 defined symbols are used). These may be rotated on screen if required. Once complete the computer will activate the circuit to display the voltage levels throughout. Your circuit may be de-activated, modified and re-activated, saved on tape for future use and copied to the printer. An invaluable aid to the designer of digital electronic circuits, either hobbyist or professional, this programme can cope with circuits from the simplest to a screenful of densly packed interconnected components.

NUMERIC £5.95

A multi-function maths toolkit programme.
It will
a. Solve any equation for a single unknown.
b. Plot the graph of any function - you may expand or contract the axes and alter the increments in order to obtain the best representation of your function.
c. Solve simultaneous and quadratic equations.
d. Solve right angle triangles.
e. Find arithmetic mean and standard deviation for a list of numbers. It will do the same for two lists plus finding the coefficient of correlation between them. Graphs can be produced for your data against the three Standard Deviation curves.

All displays can be copied to the printer if required.

ELECTRONICS requires the DK Tronics UDG board to run on a ZX81 but operates on a normal Spectrum. These superb programmes are extremely user friendly, come with comprehensive instructions and offer facilities too numerous to cover in this advertisement. Exceptional value for money.

Please state computer type:
Cheques payable to:

Spectre
2 MULL CLOSE
OAKLEY
BASINGSTOKE
HANTS

BiBi Data

Program Duplicating on cassettes?

500-20,000 Copies within 10 days?

Short run in-cassette copying. High speed, volume duplication. On-cassette body printing, labels, over-wrapping, blister carding, etc. All copies verified.

Call Nigel Boyle.
Tel: 01-223 5955, or write to:
BiBi Magnetics, Freepost, London SW11 2BR.

BiBi Magnetics Ltd, 101-105 Plough Road, London SW11 2BJ. Telex 917732.

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

BLANK STARE

■I cannot get my Spectrum to recognise the difference between a blank space — either as CHR$ 20, 1, 32 or CHR$ 143 — and an unprinted character. The Screen$ function treats them all as 32. If an Ink is specified beforehand, then I can differentiate between them using Attr. However, if I just print up an Inv Video or G-shift t-8 black square, Attr treats it as if it were blank. What can I do?

Julian Vincent, Earley, Reading.

IT IS UNFORTUNATE that it is impossible to detect user-graphics or blanks with Screen$. It seems an oversight when designing the ROM, as it is probable that Screen$ would find its widest application in moving graphics programs when you need to detect whether two objects have run into each other or have, say, run off the edge of a track or road. I get around the problem by using something other than a blank, which still prints up as a satisfactory object. You will find that the capital X very well for walls and things that you otherwise would print as a series of inverse spaces. Use Inverse 1 in the line that is printing the Xs, and detect them just looking for the X. The full stop can also be used, or the slash. Experiment with the letters of the alphabet and the symbols, to find one which does not look too much out of place in your program.

ATOM TOOLBOX

■I have a 12K plus 12K Atom and am contemplating an expansion of its facilities. Would you advise me to buy a programmer's toolbox ROM, considering the availability of the disc pack for the Atom, or to upgrade it by inserting a BBC ROM, considering the further expansion of the BBC computer? If I choose the latter, is it possible to upgrade it further to BBC model B?

W Luk, Oxford.

YOU DO NOT explain the main purposes for which your computer is used, and this has some bearing on the answer to your question. The "BBC upgrade" does not turn an Atom into a BBC Micro, but simply gives it access to a large part of BBC Basic, but not at the same speed as the BBC Micro. If you are sufficiently advanced in programming the Atom to contemplate purchasing a utility ROM such as you describe, it is likely that you would be best advised to stick with the Atom, and continue to develop your skills on that, rather than convert it to a machine which is neither one computer nor the other, and have to relearn many of the techniques you have acquired to date.

PLUG BUG

■I am 12 years old and own a 1K ZX-81 which works perfectly, except sometimes when first switched on. I have found that I can correct its odd behaviour by fiddling with the power input plug to the computer. Can you tell me what is wrong?

Michael Rabbett, Huntingdon.

THE SOCKET for the power supply — and indeed for Mic and Ear as well — tends to work loose, as you move the plugs in and out a lot. The answer is simple. Get an electrician, or a friend who knows how to do such things, to bend the metal inside the plug socket slightly, so it grips the plug firmly. As a general rule, you should not remove the plugs more than you have to. I suggest leaving them in place all the time, to minimise wear on the sockets.

SLEEP NO MORE

■I won a ZX-81 and have recently been writing a games program which involved, in part, negotiating a two-dimensional maze. The maze is randomly generated, with its only record being in the display file. By using the common

```
PEEK(PEEK 16398 +
256*PEEK 16399)
```

I thought that I could prevent the Inkey$ operated figure 1 from passing through — and erasing — the walls, which are made up from graphic spaces. For a while, I thought this had been successful, then discovered that by rapidly pressing and releasing the controlling key it was possible to pass through the wall with ease. I have tried in vain to solve the problem but it seems to be beyond me. The above is the only Peek routine I know. It works perfectly if I just want the program to stop when a wall is hit. All progress on what I hoped would be one of my best games has been halted because of this bug. I am desperate and without sleep. Can you help?

Marcus Harvey, Chipping Sodbury.

YOUR PEEK routine is correct. The most likely explanation for its failure under certain circumstances is that you are not checking the result of this Peek every time you cycle through the program, because there are two routes through it. Perhaps you are jumping some of it when the Inkey$ is not one of the vital readings, and one of the routes misses the routine. Check this by including it in another part of the program, and make sure the line which is needed as well — the Print At ending with a semicolon — is *always* immediately before the Peek/Peek.

CHEAP MEMORY

■I would like to expand the memory of my Vic-20, but it is very expensive. Commodore charges over £70 for its unit. While looking through a recent edition of *Your Computer* I saw an advert for a 16K unit for the Vic-20 for less than £40. Does this unit do the same job as Commodore's unit? Are there any catches in buying the cheap memory?

Ricky Pedelty, Sheppy.

I BOUGHT ONE of the cheaper memory units in August last year, and was unable to get it to work. I returned it, and asked to see the replacement working before I accepted it. I was happy with the demonstration in the shop, and since then, have had no problems with the unit at all. There is no indication, in terms of performance, that the cheaper memory is not doing everything the Commodore unit would provide. I suggest the dud unit I got the first time was just luck of the draw. Perhaps I would have been just as unfortunate with a Commodore expansion.

PICK A MICRO

■Please help! I often read your magazine, which I find fascinating, particularly the evaluations of micros. However, there now seems to be a bewildering range of micros available. I should be very grateful for any advice on the most appropriate one for my own needs, which are at least 32K of memory, expandable; high-resolution colour graphics, with the possibility of 3-D graphics; scientific use — I am not particularly interested in games; real typewriter keyboard; ability to turn a cassette player on and off from the computer; usable with UHF TV; a good, clear user manual; good colour; and under £400.

S J Pearson, Leeds.

IT SOUND as if you are talking about the BBC Micro model B. Check out the Electron before you make your final decision. The highest graphics resolution on the model B demands a monitor to see the graphics at their best, and would be vital for any 3-D graphics work.

MAKING A DIN

■I have just ordered a 48K Spectrum. The tape recorder I wish to use is a Philips EL-3302 which has DIN input/output sockets. As the Spectrum is only supplied with jackplug leads, I would like some information on how to connect up the Sinclair leads to DIN leads.

A R Smith, Torquay.

IT IS LIKELY that you will not be able to make the conversion satisfactorily. The Spectrum demands a high output from the cassette recorder, such as that which would be used to power an external speaker, rather than the reduced output for headphones. Secondly, the output from the Spectrum when Saving is designed for a socket with the sensitivity of an ordinary microphone socket. Speak to an electrician about tapping into the extension speaker output, and getting into the microphone, rather than ancillary, input.

LOWLAND SCROLL

■I recently received a 16K Spectrum and am still discovering new possibilities. My only question so far is about Poke 23692 which — according to the manual — will let the screen roll on and on. I have tried this, but it does not work on my machine. Do other Spectrum owners have problems with this?

B R Smit, Maarssen, The Netherlands.

THIS POKE is designed to stop the Spectrum printing up Scroll? everytime the screen is full, and needs to be positioned within the program in such a way that it is triggered fairly regularly. I usually use it within the master loop of a program. If you still get Scroll? from time to time, scatter the line throughout the program a few more times. The form I use is Poke 23692, -1.

DRAGON LORE

■I have recently bought a Dragon 32 computer and would like to know if you could recommend a book on programming in extended Basic. Also, could you tell me which other computer software is compatible with the Dragon?

Mrs J Begg, Abergavenny, Gwent.

It is rare that Tandy Colour Computer programs will run on the Dragon 32 even in cassette form. About the only way to convert Tandy software for the Dragon is to get someone with a Tandy to

```
CSAVE PROGRAM NAME "A"
```

This will save your Tandy program in ASCII form. Then you will be able to load it into the Dragon. If it is in machine-code you will not be able to run it at all. ■

DRAGON OWNERS . . .
HAVE WE GOT A GAME FOR YOU

WINTERSOFT PRESENT 5 GREAT CASSETTES TO TEST OUR METTLE AGAINST THE DEADLIEST ADVERSARIES, KEEP YOU GUESSING, AND STRETCH YOUR CREATIVITY TO THE LIMITS.



THE RING OF DARKNESS
The first fully hi-res graphic adventure game for the Dragon 32. Be you warrior, wizard, or thief you travel the enchanted land, trade with fools and kings alike, dare the depths of vast, monster filled 3D dungeons and face, at last, the secret quest. If you survive. It includes a save game facility (it could take you weeks to play).
£10.00



DRAGON TREK
An advanced Star Trek game in hi-res colour. Mixed text and graphics, moving Klingons, 5 skill levels, onboard computer and lag time interaction will have you zapping Klingons till stardate 2477.
£6.99

See review in this issue

PEPPER'S GAME PACK
6 GREAT GAMES ON ONE CASSETTE

NAD THE NECROMANCER
Nad has stolen your book of spells. Track him through the catacombs and use cunning to trap him, but watch out for serpents, trolls, ghosts, etc.

MUSHROOM MUNCHER
Stem the epedemic of blue mushrooms and flying pods. Look out for the munch monster. 6 skill levels.

CHESSBOARD TRACKER
Use cunning and strategy to trap the computer controlled runner, but beware deadly blockouts many skill levels.

CHAMELEON RUN
The canyon walls are closing in, can you fly the shuttle to level 10. 5 skills.

MASTERBRAIN
You'll need all your wits to crack the computer's code. 3 levels of difficulty.

PEPPER'S BREAKOUT
Knock the bricks from the wall. Operates by joystick or keyboard. 7 Skill levels.

TERRIFIC VALUE — ALL SIX JUST £7.95

ARTIST'S DESIGNER
Produce intricate designs in hi-res graphics and save them on cassette. Full list of features include joystick or keyboard control, circles, paint, shape replication and text merge labelling. Ideal for education, diagrams, home video captions.
£6.99

THE MINSTREL
A graphic music sheet on the screen allows you to compose masterpieces, and save them on cassette. Educational and entertaining.
£5.99

Available from selected dealers or send cheques/POs made payable to:

S.W. WINTER & CO. LTD.
101 Westminster Bridge Rd, London SE1. Tel: 01-928 5945 01-633 9611

We have Dragon 32's in stock NOW £173.00 + VAT

ZX SAS

Serious **A**pplication **S**oftware for your
16K ZX-81/ SPECTRUM 16K or 48K
(Please specify)

MATHS
For children 5-12 years of age + – */, all with exceptional HELP facility (full step-by-step explanations) and optional entry of units, then tens. **£8.00**

SALES LEDGER
Ideal small business system, day-books, statements etc for up to 200 accounts. **£10.00**

PURCHASE LEDGER
Day-books, remittance advice etc for up to 200 accounts. **£10.00**

INDEX/ RETRIEVAL SYSTEM
Four levels of data, usual facilities inc search on keyword or part of word. **£6.50**

BRIDGE
Full scoring system displays and prints full scoreboard, totals for 5 rubbers and all hands played. **£6.50**

MORTGAGE
How long will any mortgage be if the rate increases? What should I pay if the interest rate changes? Mortgage tells you (and more). **£4.50**

RETAIL ACCOUNTING
Excellent retailing system, takings/product sales analyses etc. **£10.00**

SHARE PORTFOLIO
Analyse and trace investments listings by transaction, current holdings, P&L analysis etc. **£10.00**

INCOME TAX
Tax code calculation, PAYE checking and net pay calculation for future months. **£10.00**

ZX SAS 42/45 New Broad St, London EC2M 1QY
(S.A.E. for more details)

(Dept (YC)

VIEWPOINT

THE PROGRAM THAT YOUR ZX SPECTRUM HAS BEEN WAITING FOR!



Draw complex 3-dimensional objects. View them after rotation in any or all of 3 dimensions.
Features:

1) Rotation in 3 dimensions about a single point.
2) Rotation about a line between two points.
3) Generation of stereo pairs.
4) View from one point towards another point.

Objects can be stored separately on tape and copied to the ZX printer.
Written in BASIC for you to modify to your own requirements.
Ideal for computer modelling, molecular modelling, CAD etc.

Viewpoint - with full instruction and examples
£6.50

Just starting to write machine code programs? The ideal assembler for beginners is Ultraviolet. Look at the facilities that it offers:

Works entirely in decimal (no hex problems); all Z80 instructions correctly assembled; supports the pseudo-instructions EQU, ORG (multiple ORGs allowed), DEFB, DEFW and DEFS; code can be assembled at one location and then relocated; allows alphanumeric labels of any length; full listings of assembled code and mnemonics can be output to the printer; full error trapping with faulty instruction clearly indicated; comments can be included in the source file.

The ideal complement to Ultraviolet is Infrared - an easy-to-use disassembler.

So now there is no need to be intimidated by machine code - with Ultraviolet and Infrared it's child's play! Buy them from the machine code specialists - ACS Software.

ULTRAVIOLET - £7.50 **INFRARED - £6.75**

All our Spectrum programs will work in both 16K and 48K models. Please send sae for details of ZX81 programs.

ACS SOFTWARE 7, Lidgett Crescent,
Roundhay,
Leeds LS8 1HN

FINGERTIPS

Fingertips is our regular calculator column covering calculator news, programming hints and examples of unusual applications. The column is written and compiled by calculator enthusiast David Pringle who is glad to hear of any of your ideas. *Your Computer* pays £6 for each of your contributions published.

THIS MONTH I risk the invective of readers who tell me the Sharp PC-1211 should not feature in this column. "It's not a real pocket calculator", they say. Well, here goes anyway with a program called Treasure Quest by J V Moss of London.

Fantasy games are increasing in popularity, and also variety, but it may surprise some people that it is possible to run such a game on as small a machine as the Sharp PC-1211 Pocket Computer.

In the game to be described, the player travels through a labyrinth of caves, the object being to find the treasure and bring it out of the caves within forty days.

The labyrinth is represented by a seven-by-seven square matrix of 49 caves. The caves may be empty, or they may be inhabited by fairies, trolls, giants or dragons. The player may move through the labyrinth cave by cave, using the commands N, S, E or W, representing the points of the compass. Alternatively he may rest or fight.

Initially, the player is in the most south-westerly cave, and he knows only that the treasure lies in a cave to the far north-east. On finding the treasure, he must bring it out by the most north-easterly cave.

The computer keeps a record of the days — it takes one day to journey from one cave to the next — and tells you what, if anything, inhabits the cave.

Trolls, giants and dragons are the adversaries, in order of danger, trolls being the least dangerous. The player can decide there and then to fight, which gives him the advantage in the conflict. Alternatively, the player may try to move to another cave, to return the way he came, or to rest quietly for a day. If the adversary sees him, then he will fight, and in this case the opponent has the advantage. The adversary is less likely to see you if you rest, or return the way you came.

The outcome of a fight is determined using random numbers. Fighting uses up energy — as does moving about — which can be recovered by resting. If you are injured, it is best to rest in a fairy cave, and let the fairies attend to your injuries. However, the quest must be completed within forty days.

The program uses all the available memory of the PC-1211. Therefore there are no comments, and the program must be keyed in exactly as written.

The subroutine at line 2 is a random number generator which generates a positive integer in F less than the initial value of F, using a fractional seed in E. It was positioned here because there was thought to be a speed advantage in executing a subroutine at the beginning rather than the end of the program area.

Line 100 fills the matrix with creatures for the new game. Line 110 sets up the initial values including the position of the treasure. Line 200 checks if the treasure has been brought to the north-eastern most cave. If not, lines 201 to 226 display the current situation and line 228 invites a response.

Lines 230 to 255 process the response, checking directions to ensure that the player can only move within the matrix. Line 260 checks for moving back the way you came, to alter the value of F so there is less chance of an adversary seeing you. Line 275 actions the move.

Lines 300 and 340 are concerned with "resting", and lines 350 and 360 determine whether you are spotted by an adversary. Lines 400 to 445 determine the result of a fight. lines 600 to 800 are self-explanatory.

The program could easily be adapted to run on other computers using other dialects of Basic. On the PC-1211, Beep merely sounds a buzzer, Pause displays a line for about half-a-second before going to the next line.

Variable memory is handled in a slightly strange way, in that each of the first twenty-six variables, A to Z, may be referenced in four different ways. Thus A, A$, A(1) and A$(1) all refer to the first variable, B, B$, A(2) to the second, and so on. The use of variables is listed in table 1.

In playing the game, it will be found helpful if a seven-by-seven grid is drawn, and the inhabitant of each cave marked as it is visited, in case it is wished to return to, or avoid, a particular cave. It is quite difficult to complete the quest in 40 days. Happy hunting.

Adventure game for PC-1211.

```
1     A(64)=0:GOTO 100
2     E=EXP(LN( E +  )*5): E=E-INT(E):F=INT(E*F):RETURN
100   FOR I=14 TO 62: F=5: GOSUB 2: A(I)=F:NEXT I
110   L=0: M=0: K=14: G=25: F=3: GOSUB 2:H=F:F=3:GOSUB 2:
      A(48 + F*7 -H) = 6
200   IF K = 56 IF A(64) > 0 THEN 700
201   H=A(K):IF H=6 THEN 600
202   IF H=0 BEEP 1: PAUSE"EMPTY CAVE":GOTO 225
220   BEEP 1:PAUSE"CAVE CONTAINS A ",A$(H)
225   M = M + 1: PAUSE"DAY";M:IF M= 40 PAUSE"YOUR TIME IS UP":
      STOP
226   IF K < 6 PAUSE"YOU ARE TIRED"
228   INPUT"WHAT DO YOU DO?",J$
230   IF J$ = "FIGHT" THEN 400
235   IF J$ = "REST" LET F = 3:GOTO 300
240   I = 0: IF J$ = "N" LET I = 7
241   IF J$ = "S" LET I = -7
242   IF J$ = "W" LET I = -1: IF K-INT(K/7)*7=0 THEN 290
243   IF J$ = "E" LET I = 1: IF  K-INT(K/7)*7=6 THEN 290
245   IF I = 0 GOTO 228
250   IF K+I<14 THEN 290
255   IF K+I>62 THEN 290
260   G = G -1: IF I = -L LET F = 3:GOTO 270
265   F = 6
270   IF H > 1 THEN 350
275   L = I:K = K + I:GOTO 200
290   BEEP 2: PAUSE"NO EXIT TO ";J$: GOTO 228
300   G = G + 2:IF H = 0 THEN 225
305   I = 0:IF H > 1 THEN 350
310   F = 12: GOSUB 2
320   IF F < 11 IF G < 16 PAUSE"FAIRY TENDS YOUR WOUNDS":
      G = G + 8:GOTO 225
330   IF F = 11 PAUSE"FAIRY GIVES YOU":PAUSE"A MAGIC SWORD":
      G = G + 10
340   GOTO 225
350   GOSUB 2:IF F < 2 THEN 275
360   BEEP 3: PAUSE"HE SEES YOU":PAUSE"YOU MUST FIGHT":
      I = 4:GOTO 410
400   I = 0:IF H = 0 THEN 225
410   F = 2: GOSUB 2
415   IF EXP(LN(H*(F+1)))+I>G THEN 800
420   G=G-H*2
430   BEEP 4:PAUSE "YOU KILLED THE ";A$(H): A(K)=0: H=0
435   IF G>15 THEN 228
440   J$="":IF G<8 LET J$="BADLY "
445   PAUSE "BUT YOU ARE ";J$;"INJURED":GOTO 228
600   BEEP 5:PAUSE "YOU FOUND THE TREASURE!":A(K)=0:H = 0:
      A(64) = 1: GOTO 228
700   BEEP 8:PAUSE "TASK DONE IN ";M;" DAYS"
710   PRINT"YOU MARRY THE PRINCESS!":STOP
800   BEEP 5:PRINT"YOU ARE KILLED!"

1107 STEPS
```

Table 1: memory utilisation.

A$(1) — A$(4) are set up before running. E and F are used by random number generator.

A$(1) = "FAIRY"
A$(2) = "TROLL"
A$(3) = "GIANT"
A$(4) = "DRAGON"
E = decimal fraction
F
G = energy of player
H = strength of adversary
I = working variable
J$ = interactive response
K = co-ordinate within matrix
L = previous response
M = count of days
A(14) — A(62) = matrix
A(64) = treasure found indicator.

The second program by A E Cox of Sussex, is a very interesting indexing program written for the Sharp 1500. It can sort up to 120 character strings of 79 characters each into alphabetical order and then prints them out as shown. Could it be the first genuine useful word-processing program for a pocket-sized calculator?

Each item is printed immediately after it is entered, taking up to about 4.5 lines of print. The items are then sorted out into alphabetical order — ASCII priority — and printed out lengthwise in blocks of 12 items.

The user should first check that there is adequate paper and Text mode is Csize 2. Now press Def A. Next, write first item and Enter. Write each subsequent item in the same way. To sort, press Def B. Print-out follows automatically.

To amend items, note the tally number at the end of the item to be amended. Press Break. Write L=n — tally number and Entry. Press Def C. Write the new text and Enter, then press Break. Write L=m, where m=1 + last tally number on the print-out. Enter. Press Def C; continue.

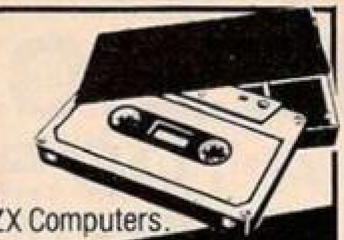
Items already entered may be printed out lengthwise without sorting, by pressing Def D. ■

Word processor for Sharp PC-1500.

```
10:"A":WAIT 0:
    CLEAR :DIM T$(
    120)*79:L=1
20:"C":INPUT T$(L
    ):LPRINT T$(L)
    ;:CSIZE 1:
    LPRINT L:CSIZE
    2:L=L+1:LF 1
30:IF L<121THEN 2
    0
40:"B":L=L-1:D=L:
    LF 2
50:A=1:E=D:D=INT
    (D*.73+.5):
    PRINT STR$ E
60:FOR B=1+DTO L
70:G$=LEFT$ (T$(A
    ), 16):H$=LEFT$
    (T$(B), 16)
80:IF G$>H$THEN 1
    00
90:GOTO 110
100:T$(0)=T$(A):T$
    (A)=T$(B):T$(B
    )=T$(0)
110:A=A+1:NEXT B
120:IF D<>ETHEN 50
130:"D":CLS :GRAPH
    :ROTATE 1:J=1
140:GLCURSOR (0,-9
    9):SORGN
150:FOR M=1TO 61
    STEP 20
160:FOR K=1TO 12
170:GLCURSOR
    K*18,0):LPRINT
    MID$ (T$(J),M,
    20):J=J+1:NEXT
    K
180:GLCURSOR (0,-2
    40):SORGN :J=J
    -12:NEXT M
190:J=J+12: IF J<=L
    THEN 140
200:TEXT :END

Priority order of characters:-
space
! " # % & ( ) * + , - . /
0 1 2 3 4 5 6 7 8 9
: ; < = > ? @
A B C ... X Y Z
sqrt pi ^
a b c ... x y z
```

A MUST FOR ANYONE INTERESTED IN ZX MACHINE CODE!



The finest range of utility programs for ZX Computers. Used by professionals. Very useful for beginners

ZX SPECTRUM MACHINE CODE SYSTEM
(The key to machine code success)

SPECTRUM EDITOR/ASSEMBLER A powerful and essential machine code programming aid. 16K and 48K on same cassette + full documentation. Major features: EDITOR with Auto line number and renumber, 40 column screen display, tabulated into fields for easy reading, 5 character label names, easy line editing and cursor control; SAVE/LOAD/VERIFY routines, output to ZX PRINTER. TWO PASS ASSEMBLER accepts all Z80 mnemonics; decimal or hex numbers, simple arithmetic on operands; Assembler Directives — ORG, END, DEFB, DEFW, DEFS, DEFL, EQU, DEFM. **ONLY £8.50**

SPECTRUM MONITOR Machine Code Debug/Disassembler Enter, Run, Debug M/C programs. Compatible with BASIC. Breakpoints and Registers Display. Disassembler to screen or ZX PRINTER. 16K and 48K on one cassette + 30 page manual. **ONLY £7.50**

ZX81 UTILITIES
(For everyone . . . beginner to professional)

ZX81 REMLOAD Machine Code Debug/Monitor Explore and master machine code. Compatible with BASIC. CREATE A REM line — any length. BREAKPOINTS & REGISTERS DISPLAY. Fully documented 30 page manual and cassette. **ONLY £6.95** 16K to 64K

ZX81 ZX-MC Machine Code Debug/Monitor The professional one! ENTER/RUN/DEBUG M/C programs. SAVE/LOAD/VERIFY at double speed. BREAKPOINTS & REGISTERS DISPLAY. Self-contained machine code — cannot be used with BASIC. 36 page manual and cassette. **ONLY £7.50** 4K to 64K

ZX81 SCREEN KIT 1 More screen power in your BASIC programs! BORDERS — any size anywhere on screen. SCROLL in 4 directions. CLEAR and REVERSE part of the screen. FLASHING CURSOR anywhere on screen — simulates INPUT. DATA FILES SAVE/LOAD BASIC variables — Double speed. 880 Bytes machine code for instant response. Becomes part of your BASIC program. **ONLY £5.70** 4K to 64K

SEND CHEQUE/P.O. FOR FAST MAIL ORDER!
S.A.E. for full details.
6 Corkscrew Hill, West Wickham, Kent BR4 9BB

*All prices include VAT & P&P.

PICTURESQUE
PICTURESQUE
PICTURESQUE
PICTURESQUE

Spectrum Software available from: Buffer Micro Streatham, Microware Leicester. Educational suppliers: Griffin & George.

NOW IN YOUR HIGH STREET SHOPS

FOOTBALL MANAGER 3D

by Addictive Games

for **SPECTRUM 48K AND ZX81 16K**



This superb game is **now available** from branches of
W. H. SMITH and BOOTS THE CHEMIST.
Manage your own team in this exciting game of skill which vividly captures the drama and excitement of real football.

FEATURES INCLUDE:
★ 4 DIVISIONS ★ F.A. CUP ★ PROMOTION & RELEGATION ★ ★ TRANSFER MARKET ★ TEAM SELECTION ★ ★ SAVE GAME FACILITY ★★★ AND MUCH MORE! ★★★

WHAT THE PRESS SAY ABOUT IT:—

IF YOU have always wanted to manage a football team, FOOTBALL MANAGER, from Addictive Games, is for you — The game is ideal for a football fanatic but the most interesting thing for us was the 3-D graphics used to create the goalmouth action — the game is a winner.
SINCLAIR USER FEBRUARY 1983

Although I'm no great football fan, I really enjoyed playing this game — excellent use is made of colour and user-defined graphics. The game is very logically put together, so that the development of strategy and tactics has a real effect. For example, one of my teams got through to the fourth round of the F.A. Cup where it was beaten by a second division side. This upset morale and meant that our promotion bid failed. Perhaps I should have given up the F.A. Cup run and held some good players back — the possibilities are endless. Brian Clough had better watch out!
ZX COMPUTING FEB/MARCH 1983

ALSO AVAILABLE FROM THE FOLLOWING SHOPS:
BUFFER MICRO SHOP (London),
MICROWARE (Leicester),
ANIROG COMPUTERS (Horley, Surrey),
SUCCESS SERVICES (Walsall),
THE COMPUTER SHOP (Newcastle),
DRAGON BYTE (Leeds)
AND OTHER GOOD COMPUTER SHOPS

PRICES:
FOR THE SPECTRUM 48K £6.95, ZX81 16K £5.95
3D GRAPHICS ONLY IN SPECTRUM VERSION
To Order send Cheque/P.O. payable to:
ADDICTIVE GAMES, Dept. YC, P.O. Box 278, Conniburrow, Milton Keynes MK14 7NE
PLEASE STATE COMPUTER

COMPUTACLUB — UK

Why not join ComputaClub-UK and have a Software Library at your fingertips? Members can receive programs for up to half-price, YES, HALF-PRICE!

Most machines are catered for and ALL our software is guaranteed. But we don't just deal in games programs either. We have a comprehensive catalogue for you to browse through at your leisure.

So fill in the form below for a *6 months* TRIAL MEMBERSHIP and accept a FREE games cassette (worth over £10.00) as our special opening offer to you the customer.

6 MONTH TRIAL MEMBERSHIP

To COMPUTACLUB-UK,
Commercial Works, Church Accrington, Lancashire.

Date ....

Please accept me as a member of your club, and send me my FREE games cassette. I enclose my fee of £7.00 made payable to "ComputaClub-UK".

My Computer is .... Storage Capacity.............
My Name is.................... (please use BLOCK CAPITALS)
My Address is ....
....
.... Tel: ....

Signed .... Age (if under 18)............
(DEPT YC)

DRAFT

Data Review, Analysis & Formulation Technique

Makes the 16K-ZX81 a serious data processing tool

". . . probably the best spreadsheet program available for the ZX81."

". . . turns the ZX81 into a serious tool for recording and analysing data at home."

"Thoughtfully written and very easy to use — yet more comprehensive than many programs written for larger computers and which take days to master."

- Spreadsheet flexible from 5 to 80 columns wide with up to 450 "grid positions"
- Comprehensive report generator and full text/data listing facilities are usable at any stage — all with instant machine code speed
- Columns are displayed 3 at a time in any order you wish — vastly superior to the clumsy "window" system
- Range of 21 calculating functions: Arithmetic, Average, Percentage, Group Total, £0.00 justification and all the keyboard scientific and trigonometric functions
- All reports and listings duplicated on the ZX printer as continuous copy
- Named DRAFT files can be 'saved' either full or empty but structured for repetitive later use
- Detailed instruction manual covers all facets of the program

£7·50 including despatch.

Send now to
Myrmidon Software,
PO Box 2, Tadworth
Surrey KT20 7LU

Please send me ____ DRAFT program(s)
I enclose a cheque/p. order for £ ______
Name ______________________
Address ______________________
____

Software File gives you the opportunity to have your programs, ideas and discoveries published. We will accept contributions for any home computer provided they are submitted to *Your Computer* exclusively. Please double-check your programs and specify the memory they require before sending them, preferably on cassette. We pay between £6 and £36 for contributions published.

Search and destroy

C Stewart,
South Shields,
Tyne and Wear.

ZX-81

THIS SHORT machine-code routine produces a missile on line 18 on the display. It proceeds upwards searching for an alien as it goes. The missile leaves the display if no obstruction is found, or blots it out if an obstruction is found. The machine code is stored in a Rem in line 1 containing 75 bytes. After entering:

```
1 REM (75 Xs)
```

enter the hex loader in figure 2. Run the program in the fast mode and enter the codes given in figure 1. They can be entered individually — 2A Newline 0E Newline — or in batches of as many as you like — 2A 0E 40 06 Newline. To operate the routine the print position must be set to:

```
PRINT AT 18, A;
```

immediately before calling the routine, where A is the column you wish the missile to appear in. To increase speed, Poke 16549 — less than 255 — and for the missile character, Poke 16520 — code character — and Poke 16533 — code character.

Input the program in figure 3, which demonstrates the routine. Run the program and move using the 5 and 8 keys. Try missing the alien and then hitting it. Line 70 keeps the score and line 30 must be within the main loop. Line 0 on the display is left untouched by the missile for scores and titles, however more can be left by Poke 16518. The routine is ideal for invader-type games.

Figure 1.

Address	Hexadecimal		
16514	2A	0E	40
	06	11	36
	05	0E	21
16523	2B	0D	20
	FC	5E	1C
	1D	20	22
	36	05	0E
16535	21	23	0D
	20	FC	36
	00	0E	21
16544	2B	0D	20
	FC	0E	FE
	0D	20	FD
16553	0E	FE	0D
	20	FD	10
	D7	36	00
	01	00	00
16565	C9	2B	2B
	2B	0E	05
	23	36	00
16574	0D	20	FA
	0E	1F	23
	0D	20	FC
	36	00	01
	0C	08	C9

Figure 2.

```
1   Rem [75 Xs]
10  Let A$=" "
20  For X=16514 To 16588
30  If A$="" Then Input A$
40  Poke X,16×Code A$+Code A$(2)-476
50  Scroll
60  Print X;"(3 spaces)"; A$(To 2)
70  Let A$=A$(3 To)
80  Next X
```

Figure 3.

```
1   Rem [machine code]
5   Let score=0
10  Print At 4,6;"▩▤▩"
20  Let A=10
30  Let L=0
40  Let A=A+(Inkey$="8" And A<29)-
    (Inkey$="5" And A>2)
50  Print At 19,A-2;"□▣■□"; At 18,A;
60  If Inkey$="0" Then Let L=Usr 16514
70  If L<>0 Then Let score=score+1
80  Goto 30
```

Space chase

Tahir Abbas,
Edinburgh.

SPECTRUM

IN THIS GAME for the 48K Spectrum, you shoot down 10 alien craft before they reach the safe zone. You are looking out of your cockpit window and have to line them up in your sights and fire your lasers. If they reach the safe zone then you have failed. The bottom of the screen displays time left and craft shot down.

To fly your ship use these keys:

Up	7
Down	6
Left	5
Right	8
Fire	0

This program uses three machine-code routines. The first of these copies the screen into another part of the memory. It acts as a kind of CLS but it recalls the saved screen only, clearing everything else on the screen.

Space Chase program construction.

```
10 TO 195--SCREEN CONSTRUCTION.
200 TO 202--LOAD DATA FOR SOUND
            AND SCREEN ROUTINES.
300 TO 305--VARIABLES.
500 TO 560--PRINT ALIEN CRAFT
            & MOVEMENT OF YOUR
            CRAFT.
605 TO 700--FIRE LASER.
800 TO 860--EXPLOSION & SOUNDS.
905 TO 980--PRINT STARS.
1000 TO 9020--END OF GAME
              ROUTINE & DATA.
```

Space Chase graphics.

```
----ABCD  LINES 505 & 605
:----E.   CHR$ 148
•----F.   LINE 965
●----G.   LINE 967
```

Register HL holds the location where the copy starts. Register DE holds location where screen is moved to. Register BC holds the amount of bytes to be transferred. LDir carries out the task of moving the block of memory.

The next machine-code routine enhances the Spectrum's sounds. It uses the Spectrum's sound routine in the ROM. Register DE holds duration of the note; register HL holds pitch of the note; and register B controls the loop.

The final machine-code routine prints out the explosion. The data for the explosion is held in location 40051 onwards. All the machine-code routines are held in Data statements within the program. So there is no need to load them separately in the Spectrum. The sound routine used in this program was developed from the sound routine printed in November's *Your Computer*.

Once you have mastered the game as it stands, you can make it more difficult by reducing the time variable "ti" in line 300.

```
   1 REM *****SPACE CHASE*****
   2 REM WRITTEN BY TAHIR ABBAS.
   3 REM          FOR THE
           48K SPECTRUM.
   5 REM SCREEN CONSTRUCTION.
  10 REM
  11 INVERSE 0: OVER 0: BRIGHT 0
 : BORDER 3: PAPER 0: INK 9: CLS
  20 INK 6: PLOT 112,64: DRAW 0,
15,-PI: DRAW 15,0: DRAW 0,15: DR
AW 1,0: DRAW 0,-15: DRAW 15,0: D
RAW 0,-15,-PI: DRAW -15,0
  30 DRAW 0,-15: DRAW -1,0: DRAW
 0,15: DRAW -15,0
  40 PLOT 105,92: DRAW -15,0: DR
AW 0,-1: DRAW 15,0: PLOT 151,92:
 DRAW 15,0: DRAW 0,-1: DRAW -15,
0
  50 INK 7
  70 PLOT 30,0: DRAW 15,15: DRAW
 1,0: DRAW 5,5: DRAW 1,0: DRAW -
5,-5: DRAW 1,0
  80 DRAW -5,-5: DRAW 20,-10
  90 PLOT 225,0: DRAW -15,15: DR
AW -1,0: DRAW -5,5: DRAW -1,0: D
RAW 5,-5: DRAW -1,0: DRAW 5,-5
 100 DRAW -20,-10
 105 REM
 106 REM COPY SCREEN
 110 FOR f=40000 TO 40050: READ
a: POKE f,a: NEXT f
 120 DATA 33,0,64,17,80,195,1,19
2,26,237,176,201,33,80,195,17,0,
64,1,192,26,237,176,201,0,0,17,1
0,0,33,10,0,6,10,197,213,229,205
```

(continued on page 135)

NEW SPECTRUM AND ZX81 SOFTWARE

"WINGED AVENGER"

Fast and furious. SPECTRUM version has SOUND and USER GRAPHICS. 7 LEVELS, 3 WAVES, MOTHER SHIP, HIGH SCORE, RE-FUELLING, RAPID FIRE, SMART BOMBS and LASER SHIELD. PCW "ONE OF THE BEST SINCLAIR GAMES YET". Only £4.50. All SPECTRUM + 16K ZX81.

"SPECTRUM SCRAMBLE"

MORE M/CODE ARCADE ACTION. "SO GOOD THE REVIEWERS DIDN'T REACH THE FINAL STAGE" (NOT BAD EH!!). NO LESS THAN 8 DIRECTIONAL KEYS for a SMOOTH MOVE. Full ARCADE features including, LASERS, BOMBS, INSTANT RESPONSE, CONTINUOUS SCORING, ROCKETS, SOUND, FUEL DUMPS, RED METEORS, DEFENDER CRAFT and HIGH SCORE. Beware CONDITION RED. With this one you MOVE, FIRE and BOMB AT THE SAME TIME. RELEASE PRICE of £4.95. 16K or 48K SPECTRUM.

"DO NOT PASS GO"
NOW THE 48K SPECTRUM VERSION IS READY

A COMPLETE SIMULATION of the BEST SELLING BOARD GAME, you know PARK LANE and all that. Up to SIX PLAYERS can compete with the MICRO doing all the WORK. Acts as DICE THROWER, BOARD, RENT COLLECTOR, UMPIRE, BANK, RULE BOOK, ACCOUNTANT and PROPERTY RECORD. SUPER GRAPHICS by Gary Kennedy (thanks mate). GAME SAVE with winner so far report. COMPLETE with INSTRUCTION BOOKLET. The ULTIMATE in FAMILY GAMES. Don't MONOPOLISE YOUR MICRO. AMAZE all your friends and family. (Can you see your GRANNY on a MICRO?) ONLY £6.95. 16K ZX81 VERSION ALSO £6.95.

"BASE INVADERS"

The ONLY ARCADE GAME EVERYBODY SHOULD HAVE. The SCREEN'S the same, THE INVADERS are the same, BUT you get a SHIELD and a CHOICE of THREE SPEEDS, (O.K., FAST or INCREDIBLE). GOOD SOUND, a HARD GAME, and GREAT GRAPHICS. COMPLETE your software collection for just £4.50. 16K and 48K SPECTRUM only.

"AUDIO SONICS"

WINNER of WIZZ KID 82. For the SPECTRUM. A.S. writes sound effects for your own programs. 26 PRE-SELECTED SOUND EFFECTS include TELEPHONE, POLICE SIREN, FROG, SPACE EFFECTS and OUTBOARD MOTOR. GO into MODIFY and you are presented with a display of SLIDER CONTROLS to adjust PITCH, RISE, FALL, BRISKNESS, DECEL, ACCELL, TONE, REPEAT RATE, STUTTER and DELAY. ADJUST the SLIDERS then INSTANTLY hear the SOUND CREATED. Call "THE SOUND ONE" and a program line will appear that is ready for insertion into your own programs. Hours of EXPLORATION. YOU WILL BE AMAZED what BEEP can DO. We are proud to offer this at £4.99. 16K or 48K SPECTRUM.

"SPECTRUM RENUMBER DELETE"

All M/CODE RENUMBERS ALL NOT PART. "YOU WON'T BUY A BETTER RENUMBER PROGRAM FOR THE SPECTRUM" JUST 600 BYTES. At £4.95. ALSO ZX81 VERSION.

"HIGH NOON"

When YOU'VE SAVED the GALAXY, SCRAMBLED or whatever else you do on your MICRO, what about a GUNFIGHT? Play the SPECTRUM or YOUR PALS. THREE LEVELS. FULL FEATURES, CACTI, COFFINS, WAGONS, RAPID or SINGLE SHOTS. SUPERB GRAPHICS. GOOD SOUND including DEATH MARCH. ESCAPISM on TAPE for JUST £4.50.

"DISPLAY"

Takes over when BIN and the DEMO tape left off. How would you like 273 different user defined GRAPHICS on a 16K SPECTRUM or a GRAND 336 for a 48K. All of these can be displayed on the screen at the SAME TIME. UDGs are stored as PAGES and any TWO PAGES may be exchanged in memory. FILES can be LOADED FROM or SAVED TO TAPE. LOAD into any page location. TURN a UDG ¼ turn, ½ turn, FLIP a SHAPE over, REVERSE a SHAPE, EXPAND ¼ of a CHARACTER into a full character, UP, DOWN, LEFT or RIGHT by one PIXEL. 5 SHAPE FILES are included on TAPE. INCLUDING a 64 CHARACTERS per LINE DISPLAY. COMPLETE with DEMO PROGRAM and INSTRUCTIONS. JUST RELEASED at £7.00. 48K or 16K SPECTRUM only.

"YAHTZI"

Up to SIX players allowed. Plays the classic DICE game of strategy. All electric scorepad complete with GARRY'S "CHUNKY LOOK" character set. All cheating and errors rejected by your electronic umpire. Update your games cupboard for £5.50. 48K ONLY.

"MATCALC"

For BUSINESS and PROFESSIONAL use. Ideal for WHAT IF situations, CASH FLOW FOREC STS and analysing RELATED figures. 64 character display option. FORMULA may be MATHEMATICAL or LOGICAL. MENU of FUNCTIONS. SAVE and LOAD DATA to TAPE. FULL instructions included. LITERALLY HUNDREDS of USES. BOTH 48K and 16K SPECTRUM PROGRAMS on ONE TAPE. JUST £7.00. EXCELLENT VALUE.

"PROGRAMMERS DREAM"

A SPECTRUM TOOLKIT. Position independent and just 1450 BYTES. Facilities RENUMBER lines or blocks any increment or start. BLOCK OR LINE MOVE including a RENUMBER into place if required. BLOCK OR LINE ERASE. CHANGE SELECTED STRINGS (NAMES OR CONTENTS). DUMP variable names and values (usable in a loop). DISPLAY PROGRAM or PROGRAM plus VARIABLE SIZE. INSTANT and CLEAN. JUST £6.95 with explicit instructions.

WORK FORCE

140 WILSDEN AVENUE, LUTON, BEDS, ENGLAND
ALSO AVAILABLE AT BUFFER, MICROWARE AND SOFTWARE SUPERMARKET.
REM WORK FORCE WORKS HARDER.

HILTON COMPUTER SERVICES LIMITED

The renowned PERSONAL BANKING SYSTEM is now available for
ZX81 ☐ ZX SPECTRUM ☐ DRAGON 32

Maintain permanent recores and fully detailed statements of your finances including:

- ALL cheque book transactions and bank receipts.
- ALL standing order payments.

AUTOMATICALLY PROCESSED (monthly, quarterly, six-monthly or annually AND for set number of payments).
In addition the ability to search, locate, delete or correct previous entries. List by category facility is included.
Additional BANK RECONCILIATION module available to automatically match your Bank Statement to your PERSONAL BANKING SYSTEM account.
Full instructions and GUARANTEED after sales maintenance provided.

PBS ZX81 £8.95 (16K) ☐ ZX SPECTRUM £9.95 (48K) ☐ DRAGON £9.95 (32K)
REC (for use with above) £5.00
Ask for the PBS at your local computer store, or ORDER (specifying for which machine) by POST from

Hilton Computer Services Limited Dept (YC)
14 Avalon Road, Orpington, Kent BR6 9AX. OR at the POST OFFICE using TRANSCASH ACCOUNT 302 9557

* YOUR PBS IS NEVER OUT OF DATE *

Great games for your Spectrum

from MIKRO-GEN the leaders in ZX games.



Sorcerer's Castle £5.50

New from Mikro-Gen – takes you into a world of magic and mystery. Graphical position and a host of options with this exciting adventure game for the 48K Spectrum

Scramble £5.50

High-speed arcade game – the fastest available. Thrust, altitude, fire and bomb controls. For 16K or 48K Spectrum

Masterchess £6.95

The program for the *real* player – a powerful, adventurous and enjoyable chess game for the 48K Spectrum

And for your ZX81:

Scramble + Frogs + Paintmaze + ZX Chess + Breakout + Space Invaders + Asteroids + Tempest + 1K Gamespack + Debug
All supplied on cassette with library case : £3.95 (ZX Chess £6.50)

Write for full details of the Mikro-Gen range of programs and add-ons, available from local stockists or direct from the manufacturers (please make cheques/PO's payable to Mikro-Gen and add 40p post & packing)

MIKRO-GEN

24 Agar Crescent Bracknell Berks RG12 2BK

(continued from page 133)

```
,181,3,1,100,0,225,237,74,209,19
3,16,240,201
 130 PRINT INK 4;AT 21,10;"TIME=
"
 140 PLOT 75,0: DRAW 0,9: DRAW 7
6,0: DRAW 0,-9: PLOT 170,0: DRAW
 0,9: DRAW -18,0
 195 LET l=USR 40000
 196 RESTORE 8600
 197 REM
 198 REM USR GRAPHICS
 200 FOR g=144 TO 150: FOR f=0 T
O 7: READ a: POKE USR CHR$ g+f,a
: NEXT f: NEXT g
 202 FOR f=40051 TO 40169: READ
a: POKE f,a: NEXT f
 210 POKE 40027,10: POKE 40033,1
0: POKE 40041,100
 230 LET l=USR 40012: PAUSE 30
 300 LET ti=500: LET sh=10
 305 LET x=INT (RND*15): LET y=I
NT (RND*27)
 310 GO SUB 500
 330 GO TO 900
 500 PRINT AT x,y;"[graphic]"
 505 PRINT AT 21,15;ti: LET ti=t
i-1
 510 LET x=x+INT (RND*3)-1+(INKE
Y$="7")-(INKEY$="6")
 520 LET x=x+2*((x<0)-(x>16))
 530 LET y=y+INT (RND*3)-1+(INKE
Y$="5")-(INKEY$="8")
 540 LET y=y+2*((y<0)-(y>28))
 550 LET l=USR 40012
 560 RETURN
 600 REM
 605 PRINT AT x,y;"[graphic]"
 610 INK 3: PLOT 54,22: DRAW 72,
67: PLOT 201,22: DRAW -72,67: LE
T l=USR 40026: INK 7
 620 IF POINT (128,90)=1 THEN GO
 TO 800
 660 GO SUB 500
 700 RETURN
 800 REM
 801 LET l=USR 40012
 803 PRINT AT 21,15;ti
 804 POKE 40027,5: POKE 40033,20
: POKE 40041,30
 805 FOR f=1 TO 2: LET l=USR 400
26: POKE 40033,60: NEXT f
 806 PRINT AT 0,0;
 810 POKE 40027,1: POKE 40033,1:
 POKE 40041,0: POKE 40159,0
 815 POKE 40150,INT (RND*2)+148
 820 PRINT : LET L=USR 40135
 825 POKE 40150,32
 830 POKE 40027,1: POKE 40033,1:
 POKE 40041,0: POKE 40159,12
 832 PRINT : LET L=USR 40135
 834 LET L=USR 40012
 835 POKE 40027,10: POKE 40033,5
: POKE 40041,250: FOR f=1 TO 10:
 LET l=USR 40026: NEXT f
 845 POKE 40027,10: POKE 40033,1
0: POKE 40041,100
 850 LET sh=sh-1: PRINT AT 21,20
;sh: IF sh=0 THEN GO TO 2400
 860 FOR F=1 TO 20: NEXT F: GO T
O 305
 905 LET v=INT (RND*4)+1
 910 IF ti<23 THEN GO TO 1000
 920 RESTORE 7000+v
 930 LET a$="."
 940 FOR f=1 TO 6
 950 GO SUB 500
 960 READ j,k
 965 IF j<8 OR j>11 THEN LET a$=
"●"
 967 IF j<4 OR j>15 THEN LET a$=
"●"
 970 PRINT BRIGHT 1;AT j,k;a$
 975 IF INKEY$="0" THEN GO SUB 6
00
 980 NEXT f
 990 GO TO 905
1000 LET z=85: LET g=85: LET l1=
85: LET l2=5
1010 PLOT z,g: DRAW l1,0: DRAW 0
,l2: DRAW -l1,0: DRAW 0,-l2
1020 GO SUB 500
1030 LET z=z-5: LET g=g-5: LET l
1=l1+10: LET l2=l2+10: IF z=0 TH
EN GO TO 2000
1050 GO TO 1010
2000 POKE 40027,10: POKE 40033,1
0: POKE 40041,100: LET l=USR 400
12: FOR f=1 TO 20: LET l=USR 400
26: NEXT f: FOR f=1 TO 100: NEXT
 f: CLS
2005 LET TI=0
2010 BORDER 2: PAPER 3: INK 9: C
LS : PRINT : PRINT : PRINT "YOU
HAVE FAILED IN YOUR MISSION."'';
sh;" ENEMY CRAFTS REACHED THE SA
FE"''"ZONE."
2015 GO SUB 2700
2020 INPUT "DO YOU WISH TO PLAY
AGAIN ?           (y/n)";A$
2030 IF a$="y" OR a$="Y" THEN BO
RDER 3: PAPER 0: INK 9: CLS : PA
USE 50: RUN 205
2040 PRINT ''"THANK YOU FOR PLAY
ING.": STOP
2410 POKE 40027,5: POKE 40033,20
: POKE 40041,200: LET L=USR 4001
2
2420 FOR F=1 TO 5: LET L=USR 400
26: NEXT F
2500 PAUSE 100: INK 1: BORDER 4:
 PAPER 6: CLS : PRINT AT 0,0;"WE
LL DONE"''"YOU HAVE COMPLETED YO
UR MISSION SUCCESSFULLY."
2510 PRINT ''"ALL 10 ENEMY CRAFT
 ARE DESTROYED"
2520 GO SUB 2700
2600 GO TO 2020
2700 PRINT ''"YOUR SCORE IS ";TI
*10+((10-SH)*10): RETURN
7001 DATA 10,15,9,14,8,13,7,11,4
,6,0,0
7002 DATA 10,16,9,17,8,18,7,20,4
,25,0,31
7003 DATA 10,15,11,14,12,13,13,1
1,16,6,21,0
7004 DATA 10,16,11,17,12,18,13,2
0,16,25,21,31
8600 DATA 0,24,60,63,63,63,60,24
,17,35,71,141,255,255,127,9,136,
196,226,177,255,255,254,144,0,24
,60,252,252,252,60,24
8620 DATA 0,BIN 10000000,0,BIN 0
0000010,0,BIN 01000000,0,BIN 000
01000
8630 DATA 0,0,56,124,124,124,56,
0,60,126,255,255,255,255,126,60
9000 DATA 10,15,10,16,8,17,12,14
,12,17,6,14,12,18,8,13,8,18,12,1
3,9,12,11,19,11,12,9,19,7,13,13,
18,7,18,13,13,13,12,7,19,13,19,7
,12,6,14,14,17,6,17,14,14,12,11,
8,20
9010 DATA 8,11,12,20,14,15,6,16,
14,16,6,15,9,21,11,10,11,21,9,10
,10,22,10,9,15,16,5,16
9020 DATA 33,115,156,6,42,62,22,
215,126,215,35,126,215,35,62,32,
215,197,229,205,90,156,33,232,4,
43,124,181,32,251,225,193,16,227
,201
```

Screen copy.

```
40000 LD    HL,16384
40003 LD    DE,50000
40006 LD    BC,6335
40009 LDIR
40011 RET
40012 LD    HL,50000
40015 LD    DE,16384
40018 LD    BC,6335
40021 LDIR
40023 RET
```

Sound enhancer.

```
40026 LD    DE,5
40029 LD    HL,10
40032 LD    B,20
40034 PUSH  BC
40035 PUSH  DE
40036 PUSH  HL
40037 CALL  949
40040 LD    BC,200
40043 POP   HL
40044 ADC   HL,BC
40046 POP   DE
40047 POP   BC
40048 DJNZ  40034
40050 RET
```

Dream machine

Tim Goldingham,
Maidenhead,
Berkshire.

DRAGON

MOST ADVENTURE games involve a series of choices among a finite number of situations. Here is a program that gives a completely free rein to your imagination. It is written for the Dragon, but could be readily adapted for other machines.

The scenario is that the computer has been plugged in to your unconscious mind, and its RAM now contains details of the dream you dreamed last night, which you yourself have now forgotten. You have to reconstruct the dream by a series of yes or no questions. The resultant dialogue can be both hilarious and revealing.

It is strongly recommended that you run the program a few times without attempting to understand how it works; if possible, have a friend key it in for you.

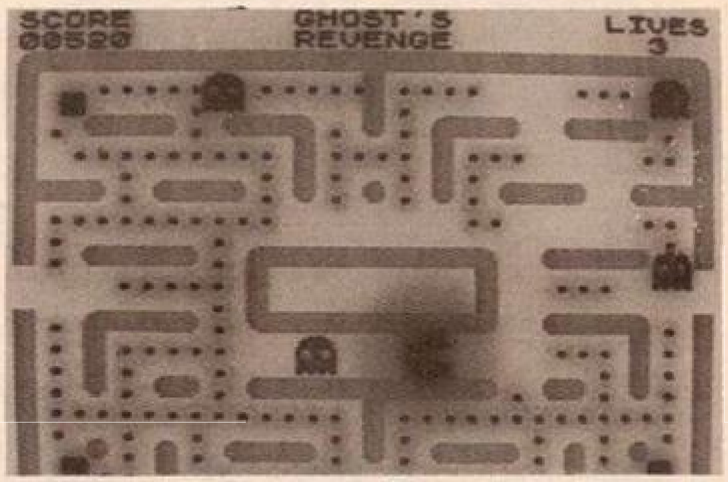
The program is based on a party game, in which one of the players who does not know the rules is sent out of the room. The other players ostensibly concoct a dream; but in fact the simple rule is that they answer "Yes" to any question ending in a vowel, while questions ending in a consonant get a "No" response. Y is treated as ambivalent.

This simple algorithm has some limitations. In practice, very few words end in vowels other than "e"; and the game is inclined to get stuck

(continued on page 137)

ZX SPECTRUM

GHOST'S REVENGE



At last a maze-chaser game for the Spectrum that rivals the arcade original. Written in super fast machine code and featuring some of the best graphics, colours and sounds for the spectrum.

•Joystick or keyboard operation • Realistic gobble action in all 4 directions • Four intelligent ghosts that will chase or run from you • Pulsating power pills that change the ghosts' colours • Eat the running ghosts for 400, 800, 1,200, 1,600 bonus pts. • Skill level selection enables both beginners and experts to play • Harder levels feature invisible mazes • Full solid effects times and top score.

DESPATCHED BY 1ST CLASS RETURN POST

ONLY £5.95 INCLUDING 1ST CLASS POST & PACKING

YC1

Post coupon now to: **MICROMANIA SOFTWARE 14 Lower Hill Rd, Epsom, Surrey KT1A 8LT.**

Please rush me

☐ copies of GHOST'S REVENGE at £5.95

I enclose Cheque/PO/cash for £

Sorry no credit cards.

Name ____________________

Address ____________________

____

Micromania

Cassette-Based Business Software by Andrew Crane

for

EPSON HX-2? PORTABLE

NEW from *MST CONSULTANTS*

STOCK CONTROL PACKAGE

£25.00 fully inclusive

You will wonder how you ever managed without this simple-to-operate, self-contained, functional, stock-control system. Features include

*Hard copy on integral printer
*Ready access to all stock records
*Date and time recordings of printer listings
*Ability to store thousands of stock items on microcassette files
*Menu-based options displayed on integral LCD screen Software Menu Options include:
Add/Amend stock, stock search, delete stock, reorder report, stock evaluation, stock list, amend stock levels, file exchange.

Also **EPSON HX-20 DATABASE**. SUPER-CAPACITY card index system. Choose your own headings. Facilities include sorts, searches, field totals etc. £25 inclusive.

DRAGON 32 PACKAGES — available NOW

MST DATA BASE — Card Index filing system. £14.95 inclusive.
MST INVOICES and STATEMENTS — Prints excellent and detailed documents, etc. £14.95 inclusive.
MST STOCK CONTROL — Stock lists, stock evaluation, Reorder reports, etc. £14.95 inclusive.
MST BUSINESS ACCOUNTS — Debtor/Creditor details and summaries, etc. on printout. £14.95 inclusive.
MST MAILER — Dedicated database for formatted address labels etc. £14.95 inclusive.

Each program comes with descriptive leaflet, operator notes, etc. Each customer will receive details of our hot-line link. Cheques and Postal Orders should be made payable to MST Consultants. Fully-inclusive prices include VAT and postage costs.
TRADE INQUIRIES WELCOME.

Send your remittance or Access card no. & signature to:
MST CONSULTANTS
Newton Road, Bovey Tracey,
Newton Abbot, South Devon TQ13 9BB.
Tel: 0626-832617

Access

COLLEGE OF SPECTRUM ZX81 USERS

(BBC users very soon!)

This is to certify that

SCISOFT

Educational material is an aid to passing 'O' Levels/CSE.
The following packages are highly recommended.

STUDY PACKS (include a comprehensive book of notes)

Physics "O" Level £7.50
Chemistry "O"/CSE Level £7.50
Biology "O" Level £7.50
Maths I "O" Level 6.00 } If ordered
Maths II "O" Level £6.00 } together £8.00
Computer Studies "O"/CSE £6.00
Teachers Markbook £6 (ZX81) £10 (Spectrum)

JUNIOR SCHOOL

Jungle Maths (+ — × —) £5 } All for
Astromaths (%, Decimals, Fractions) £5 } BBC
Magic Spell (Spelling) £5
Music* I, II, III £5 each
Communicator* (Morse, Semaphore etc) £5

*ZX81 only

Please add 50p for Postage and Packing

5 MINSTER GDNS, NEWTHORPE, EASTWOOD, NOTTS.

(continued from page 135)

if the questioner ends most of his questions with "me". The computer program overcomes these limitations by selecting five letters at random at the beginning of each run. If a question ends in any of the selected letters, it is given one of a choice of affirmative answers, picked at random. Similarly, a further three letters are selected which produce "maybe" answers. Even when you know the rules you will still find the game addictive, because you do not know what choice of letters has been made for the current run.

To increase the variety of responses, questions beginning "Had I", "Did I" are answered "Yes, you had" or "No, you didn't"; sometimes the remainder of the question is repeated, sometimes not.

Looking at the program in more detail, lines 80 to 150 produce a suitably scientific-looking "brain scan": any similar graphics pattern could be substituted, or this section omitted.

As there are some letters which very rarely end a word, line 200 lists those from which the selection will be made. Lines 210 to 280 then set up two variables, C$ and D$, containing respectively five and three letters. The Instr function is used to ensure that no letter is selected twice. Any question ending in a letter that appears in C$ will receive a "yes" answer, while the three letters in D$ will produce a "maybe".

The question is read at line 300, and stripped of its question mark by line 340. Also, line 360 removes a final "s", so that a succession of plurals does not produce the same answer. The last letter of the question is then compared with C$ and D$, by lines 380 and 390.

Responses are selected at random from the appropriate set. Lines 600-630 and 710-740 transpose pronouns and auxiliary verbs. Notice line 760, which prevents the question "Was I with my aunt?" from receiving the answer "Yes, you were with my aunt".

To introduce some variety, questions are counted by line 330, and the first "No" answer after 25 questions prompts the possibly misleading response "Haven't you forgotten something?"

If you want a recap, an asterisk will print all the questions that received the answer "yes" — lines 810-850. Finally, if you must cheat, a hash sign will show you which letters are currently being used to make the selection — line 320.

You can experiment with variations of the program by altering the letters from which the selection is made — line 200; by adding extra responses; or by altering the probability of any particular one being selected — lines 420 and 470.

```
10 'THE DREAM MACHINE
20 'COPYRIGHT T P GOLDINGHAM 1982
30 CLEAR 2000
40 DIM A$(300)
50 CLS5:PRINT"THE COMPUTER WILL MONITOR YOUR  UNCONSCIOUS MIND. HOLD THE LEAD TO
 THE TELEVISION SET, AND RELAXCOMPLETELY."
60 PRINT:PRINT"PRESS THE SPACE BAR WHEN YOU AREREADY."
70 IF INKEY$()" " THEN 70
80 'chart
90 PMODE 4,1:SCREEN 1,0:PCLS
100 N=4
110 FOR J=0 TO 252 STEP N
120 R=RND(96):X=J+N:Y=116-R
130 LINE(J,70)-(X,Y),PSET:SOUND R,1:LINE(X,Y)-(J+N,70),PSET
140 NEXT
150 SCREEN 0
160 'set parameters
170 CLS5:PRINT"THE COMPUTER HAS NOW STORED THE DREAM YOU HAD LAST NIGHT. YOUR  C
ONSCIOUS MIND IS NOT AWARE OF  THIS: YOU HAVE TO GUESS IT BY A SERIES OF YES/NO
QUESTIONS."
180 PRINT:PRINT"PRESS THE SPACE BAR TO START."
190 IF INKEY$()" " THEN 190
200 A$="ABDEGHKLMNOPRTW"
210 FOR J=1 TO 5
220 B$=MID$(A$,RND(LEN(A$)),1):IF INSTR(1,C$,B$)0 THEN 220
230 C$=C$+B$
240 NEXT J
250 FOR J=1 TO 3
260 B$=MID$(A$,RND(LEN(A$)),1):IF INSTR(1,D$,B$)0 THEN 260
270 D$=D$+B$
280 NEXT J
290 CLS5
300 LINE INPUT Z$:IF LEN(Z$)(1 THEN 300
310 IF Z$="*" THEN 810
320 IF Z$="#" THEN PRINT:PRINT"yes "C$,"maybe "D$:PRINT:PRINT:GOTO 300
330 B=B+1
340 X=ASC(RIGHT$(Z$,1)):IF X(65 THEN Z$=LEFT$(Z$,LEN(Z$)-1):GOTO 340
350 E$=Z$
360 IF X=83 THEN Z$=LEFT$(Z$,LEN(Z$)-1)
370 F$=RIGHT$(Z$,1)
380 IF INSTR(1,C$,F$)0 THEN 450:'yes
390 IF INSTR(1,D$,F$)0 THEN 500:'maybe
400 'no
410 R=RND(9)
420 PRINT" ":ON R GOSUB 560,570,580,590,610,610,610,610,610
430 GOTO 300
440 'yes
450 R=RND(9)
460 A$(A)=E$:A=A+1
470 PRINT" ":ON R GOSUB 660,670,680,690,700,710,710,710,710
480 GOTO 300
490 'maybe
500 R=RND(9)
510 IF R(4 THEN PRINT" WELL, MAYBE"
520 IF R)3 AND R(7 THEN PRINT" YOU COULD SAY THAT"
530 IF R)6 THEN PRINT" I SUPPOSE SO"
540 GOTO 300
550 'messages - no
560 PRINT"NO":IF B)25 THEN PRINT"HAVEN'T YOU FORGOTTEN SOMETHING?":B=-50:RETURN
ELSE RETURN
570 PRINT"DEFINITELY NOT":RETURN
580 PRINT"CERTAINLY NOT":RETURN
590 PRINT"NOT REALLY":RETURN
600 IF LEFT$(Z$,6)="DID I "THEN PRINT"NO, YOU DIDN'T";:GOSUB 760:RETURN
610 IF LEFT$(Z$,6)="HAD I "THEN PRINT"NO, YOU HADN'T";:GOSUB 760:RETURN
620 IF LEFT$(Z$,6)="WAS I "THEN PRINT"NO, YOU WEREN'T";:GOSUB 760:RETURN
630 IF LEFT$(Z$,7)="WAS IT "THEN PRINT"NO, IT WASN'T";:GOSUB 700:RETURN
640 GOTO 560
650 'messages - yes
660 PRINT"YES":RETURN
670 PRINT"THAT'S RIGHT":RETURN
680 PRINT"CORRECT":RETURN
690 PRINT"YOU'RE GETTING WARMER!":RETURN
700 PRINT"THAT'S IT":RETURN
710 IF LEFT$(Z$,6)="DID I "THEN PRINT"YES, YOU DID";:GOSUB 760:RETURN
720 IF LEFT$(Z$,6)="HAD I "THEN PRINT"YES, YOU HAD";:GOSUB 760:RETURN
730 IF LEFT$(Z$,6)="WAS I "THEN PRINT"YES, YOU WERE";:GOSUB 760:RETURN
740 IF LEFT$(Z$,7)="WAS IT "THEN PRINT"YES, IT WAS";:GOSUB 780:RETURN
750 GOTO 660
760 IF RND(3))1 AND INSTR(1,Z$,"MY")=0 THEN PRINT MID$(Z$,6) ELSE PRINT
770 RETURN
780 IF RND(3))1 THEN PRINT MID$(Z$,7) ELSE PRINT
790 RETURN
800 'print summary
810 FOR J=0 TO A
820 G$=LEFT$(A$(J),5)
830 IF G$="DID I"OR G$="HAD I"OR G$="WAS I"THEN A$(J)=MID$(A$(J),7)
840 PRINT A$(J)
850 NEXT J
860 GOTO 300
```

Option

Peter Lewis,
Widnes,
Cheshire.

VIC-20

WHEN PROGRAMMING the sound registers on the Vic, there are only two ways to cut out the sound. The first is to Restore the computer, however this also clears the screen. The other alternative is to re-Poke all the registers.

This program introduces a third option. It allows the user to control the volume of sound by using the function keys. The program is called up 60 times a second by using the IRQ routine.

It is initiated by the command SYS 673 and can be switched off by restoring the Vic.

```
5 I=673
10 READ A
20 IFA= 999 THEN END
22 POKEI,A
24 I=I+1
26 GOTO 10
30 DATA 169,173,141,20,03,169,02,141,21,03,96,234
40 DATA 32,184,02,32,205,02,76,191,234,234,234
50 DATA 165,197,201,39,240,01,96,173,14,144
60 DATA 201,00,208,01,96,206,14,144,96,234,234
70 DATA 165,197,201,47,240,01,96,173,14,144
80 DATA 201,15,208,01,96,238,14,144,96
90 DATA 999
100 REM *** SYS673 TO START ***
110 REM ***  RESTORE TO END ***
```

Lawn mower

Shingo Sugiura,
Putney,
London.

BBC

HAVING FAILED all your O-levels you could only get a job as a lawn mower, but the garden is not as calm as it seems. There are explosive cricket balls which you must not run over and rocks which will blow you up if touched. On top of this if your oil runs out, you will be vaporised.

When you first run this game you will be greeted by a short instruction. Then you are asked to input your speed, level and the loudness. After this the game starts with a short burst of music. You must guide the mower around the garden whilst avoiding the cricket balls and the rocks and gobbling up the oil cans, but this is not all. If you mow over an area already mowed, your oil will decrease but your score will stay the same. So the trick is to avoid areas that you have mowed.

All this furious action is accompanied by music in the background and a constant update

(continued on next page)

(continued from previous page)

of the score and high score.

If you want to change the speed, level or loudness simply press Escape. This will start the program again without clearing the high score.

Lines 10 to 280, main program; lines 290 to 450, initialising procedure; lines 460 to 490, introduction music; lines 500, 510, data for introduction music; lines 520 to 540, delay procedure; lines 550 to 650 set up the screen; lines 660 to 730, obstacles procedure; lines 740 to 790 print the oil cans; lines 800 to 850 print the mower; lines 860 to 900 check the colour in front of the mower; lines 910 to 940 print the readouts; lines 950 to 1010, ending procedure; lines 1020 to 1060 go on to next screen procedure; lines 1070 to 1090, music at each new screen; line 1100, data for the music at the end of the screen; lines 1110 to 1180, music during the game; lines 1190 to 1390, instructions.

When typing the program in leave out line 10 and put it in after the program is running.

```
10 ON ERROR GOTO 30
20 hi%=0:screen%=1
30 MODE1:PROCinit:PROCinst
40 live=2
50 score=0:screen%=1
60 VDU23;10,32;0;0;0;17,130,12
70 PROCwall:PROCobst:PROCcans:PROCintro
80 PROCinit
90 REPEAT
100 PROCprint_mower
110 PROCwait(wait%)
120 PROCdisplay
130 PROCmusic
140 IF INKEY(-98)=-1 THEN A$="LEFT"
150 IF INKEY(-67)=-1 THEN A$="RIGHT"
160 IF INKEY(-73)=-1 THEN A$="UP"
170 IF INKEY(-105)=-1 THEN A$="DOWN"
180 VDU17,3,31,x%,y%,233
190 IF A$="LEFT" THEN x%=x%-1
200 IF A$="RIGHT" THEN x%=x%+1
210 IF A$="UP" THEN y%=y%-1
220 IF A$="DOWN" THEN y%=y%+1
230 VDU26:col%=POINT(x%*32+16,(31-y%)*32+16):IF col%<>2 THEN PROCcheck
240 score=score+0.1:oil=oil-0.1:IF score>51*screen% THEN PROCupdate
250 IF oil<=3 THEN SOUND3,2,1,1 ELSE SOUND&13,-0,0,0
260 IF oil<=0 THEN PROCend
270 UNTIL FALSE
280             ************************************************
290 DEFPROCinit
300 RESTORE 1150
310 A$="RIGHT":x%=15:y%=15:oil=40
320 ENVELOPE1,1,6,6,6,255,255,255,126,-1,0,-10,126,80
330 ENVELOPE2,4,6,-3,-3,4,2,2,0,0,-1,0,63,50
340 VDU23,224,255,255,255,255,255,255,255,255
350 VDU23,225,126,129,255,129,126,24,24,60
360 VDU23,226,60,24,24,126,129,255,129,126
370 VDU23,227,112,168,169,175,175,169,168,112
380 VDU23,228,14,21,149,245,245,149,21,14
390 VDU23,229,60,126,255,255,255,255,126,60
400 VDU23,230,0,0,28,62,124,254,255,127
410 VDU23,231,24,24,24,255,126,126,126,126
420 VDU23,232,73,42,8,99,0,42,73,0
430 VDU23,233,238,219,179,153,245,156,109,170
440 VDU19,2,2;0;19,3,3;0;
450 ENDPROC
460 DEFPROCintro:RESTORE 500
470 FOR music=1 TO 18:READ pitch,duration:SOUND1,-(loudness%),pitch,duration:N
EXT music
480 PRINTTAB(16,15);"        ":PROCwait(3000)
490 ENDPROC
500 DATA101,5,121,3,137,5,121,2,129,2,121,2,129,2,121,4,117,3
510 DATA101,5,121,3,137,5,121,2,129,2,121,2,129,2,121,4,117,3
520 DEFPROCwait(T%)
530 FOR delay%=1 TO T%:NEXT delay%
540 ENDPROC
550 DEFPROCwall
560 VDU17,1,31,2,30:PRINT"OIL ";TAB(2,31);"SCORE ";
570 PRINTTAB(15,30);"MOWERS LEFT ";live;TAB(30,31);"SCREEN ";screen%;
580 PRINTTAB(15,31);"HI-SCORE ";TAB(15,0);"<<MOWER>>";
590 FOR wall=1 TO 38
600   VDU31,wall,1,224,31,wall,28,224
610   NEXT wall
620 FOR wall=1 TO 28
630   VDU31,1,wall,224,31,38,wall,224
640   NEXT wall
650 ENDPROC
660 DEFPROCobst:COLOUR1
670 FOR obst=1 TO screen%*4+6
680   VDU31,RND(34)+1,RND(26)+1,229
690   VDU31,RND(34)+1,RND(26)+1,230
700   IF loudness%>0 THEN SOUND0,-15,6,1
710   PROCwait(100)
720   NEXT obst
730 ENDPROC
740 DEFPROCcans:COLOUR0
750 FOR cans=1 TO level%:VDU31,RND(34)+1,RND(26)+1,231
760   IF loudness%>0 SOUND2,1,1,1
770   PROCwait(700):NEXT cans
780 VDU17,0,31,15,15,228,17,3,31,16,15:PRINT" READY!":PROCwait(800)
790 ENDPROC
800 DEFPROCprint_mower
810 IF A$="RIGHT" THEN VDU17,0,31,x%,y%,228
820 IF A$="LEFT" THEN VDU17,0,31,x%,y%,227
830 IF A$="UP" THEN VDU17,0,31,x%,y%,225
840 IF A$="DOWN" THEN VDU17,0,31,x%,y%,226
850 ENDPROC
860 DEFPROCcheck
870 IF col%=0 oil=oil+2:IF loudness%>0 SOUND2,1,1,1
880 IF col%=3 THEN score=score-.1
890 IF col%=1 THEN PROCend
900 ENDPROC
910 DEFPROCdisplay:COLOUR1
920 IF score>hi% THEN hi%=score
930 PRINT TAB(9,30);INT(oil);" ";TAB(9,31);INT(score);TAB(24,31);hi%;
940 ENDPROC
950 DEFPROCend:SOUND0,1,1,1
960 SOUND&11,-0,0,0:SOUND&13,-0,0,0:VDU17,0,31,x%,y%,232:PROCwait(3000)
970 live=live-1:IF live>=0 THEN 60:ENDPROC
980 score=0:*FX15,0
990 VDU17,0,30:PRINT"DEAD!":PRINT"Press SPACE BAR to play again!"
1000 REPEAT UNTIL GET=32:GOTO40
1010 ENDPROC
1020 DEFPROCupdate
1030 SOUND&11,-0,0,0
1040 PROCprint_mower:VDU17,0,31,11,14
1050 PRINT"SCREEN ";screen%;" COMPLETED!":PROCnewscreen
1060 PROCwait(5000):screen%=screen%+1:GOTO60:ENDPROC
1070 DEFPROCnewscreen:RESTORE1100
1080 FOR music=1 TO 6:READ pitch,duration:SOUND1,-(loudness%),pitch,duration
1090   NEXT music:ENDPROC
1100 DATA81,3,101,3,117,3,129,5,117,3,129,5
1110 DEFPROCmusic:IF ADVAL(-6)<1 THEN ENDPROC
1120 READ pitch%,duration%:IF pitch%=0 THEN volume=0 ELSE volume=-(loudness%)
1130 IF duration%=999 THEN RESTORE 1150:ENDPROC
1140 SOUND1,volume,pitch%,duration%:ENDPROC
1150 DATA 101,5,121,5,0,0,121,5,117,3,109,2,117,4,121,5,101,4,0,1,101,4,0,1
1160 DATA 101,4,121,5,0,0,121,5,117,2,109,2,117,4,121,5,101,4,0,1,101,4,0,1
1170 DATA 101,4,89,5,0,0,89,5,81,5,0,0,81,5,73,6,0,7,101,5,89,5,0,0,89,5
1180 DATA 81,5,0,0,81,5,73,6,0,10,999,999
1190 DEFPROCinst
1200 VDU17,1,31,15,0,225:PRINT" MOWER ";CHR$225
1210 VDU17,2,31,10,3,231:PRINT" By Shingo Sugiura ";CHR$231:COLOUR3
1220 PRINT''"  Having failed all your 'O' levels youronly job was as a lawn mow
er of a ratherpeculiar garden..."
1230 PRINT''"    There are many hazards to this job. For instance there are exp
losive cricketballs which you must obviously avoid andthere are rocks which woul
d blow you up if touched.  On top  of this your mower oil is limited."
1240 COLOUR2:PRINT'''"    To change levels press ESCAPE."
1250 COLOUR1:PRINT''"     Press SPACE BAR to continue!";:REPEAT UNTIL GET=32:CLG
1260 VDU17,130,12,17,1,31,15,0:PRINT"CHARACTERS"
1270 VDU17,1,31,5,3,224:PRINT"     --------------------Wall...."
1280 VDU17,0,31,5,5,228:PRINT"     ---------------------You...."
1290 VDU17,1,31,5,7,229:PRINT"   -Explosive cricet ball...."
1300 VDU31,5,9,230:PRINT"    -------------------Rock...."
1310 VDU17,0,31,5,11,231:PRINT"     ---------------Oil can...."
1320 COLOUR1:PRINT''"   CONTROLS:-"
1330 PRINT'"      Z -----------LEFT..":PRINT"      X ----------RIGHT.."
1340 PRINT"      : -------------UP..":PRINT"      / -----------DOWN.."
1350 COLOUR0:PRINT'" Input speed 1(FAST) to 9(SLOW) ";:REPEATI%=INSTR("12345678
9",GET$):UNTILI%:PRINT;I%:wait%=I%*10
1360 PRINT'" Input level 1(HARD) to 5(EASY) ";:REPEATI%=INSTR("12345",GET$):UNT
ILI%:PRINT;I%:level%=I%*4+3
1370 PRINT'" Input loudness 0(SILENT) to 9(LOUD) ";:REPEATI%=INSTR("0123456789"
,GET$):UNTILI%:PRINT;I%-1:loudness%=(I%-1)
1380 PRINT''"   Press SPACE BAR to play game!";:REPEAT UNTIL GET=32
1390 ENDPROC
```

On the grid

Stephen Vine,
Redhill,
Surrey.

VIC-20

THIS PROGRAM for the Vic-20 plus a printer will create those puzzles in which a set of words are hidden in a grid of letters. All you have to do is to think of the actual words you want to be hidden, enter them and the program will randomly orientate them for someone to find.

Those of you who have no extra memory will have difficulties. It is possible to work the program but with these few changes: lines 310 to 360 should be left out. This is the alpha sort and is not essential. Also you will have to do away with the display and use up the screen RAM; do this by:

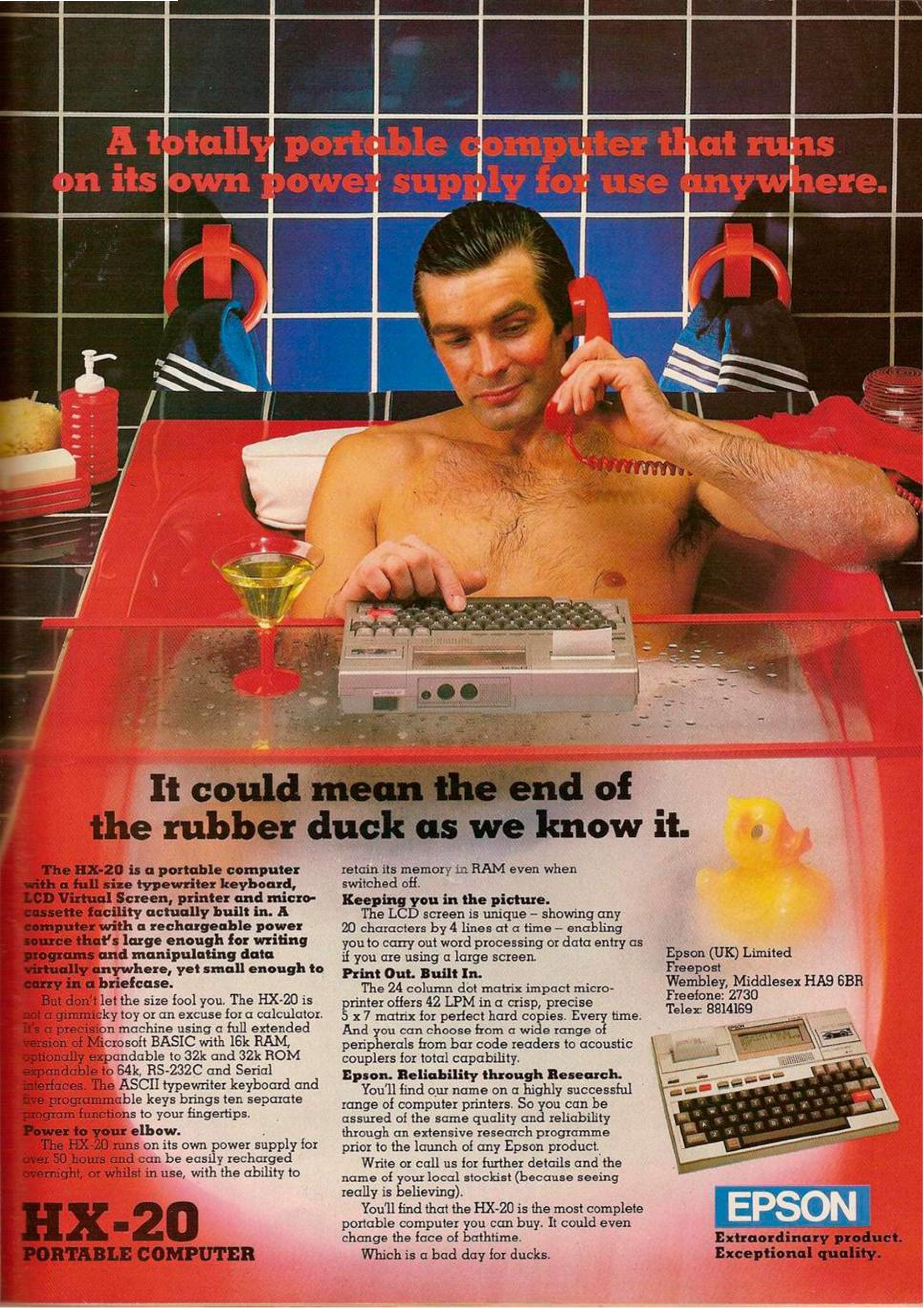
POKE 56,32
POKE 55, 0
CLR
POKE 648, 32 (return) (run/stop-restore)

Do this after entering and saving the program. After that you will not be able to see

(continued on page 141)

```
10 INPUT"SIZE OF GRID";X,Y:DIMG$(X,Y)
20 INPUT"NUMBER OF WORDS";N:DIMW$(N+INT(N/3+1)):GOSUB600
30 DEFFNR(A)=INT(RND(1)*A)+1
35 FORI=1TO8:READX(I),Y(I):NEXT
40 FORI=1TON
50 W=LEN(W$(I)):R=0
60 GX=FNR(X):PX=GX
70 GY=FNR(Y):PY=GY
80 DR=FNR(8):XD=X(DR)
90 YD=Y(DR)
100 FORJ=1TOW
110 IFG$(PX,PY)<>MID$(W$(I),J,1)ANDG$(PX,PY)<>""THEN200
120 PX=PX+XD:PY=PY+YD:IFPX<1ORPX>XORPY<1ORPY>YTHEN200
130 NEXT
140 FORJ=1TOW
150 G$(GX,GY)=MID$(W$(I),J,1):GX=GX+XD:GY=GY+YD:NEXT
160 NEXTI:GOTO300
200 R=R+1:IFR>X*YTHEN250
210 GOTO60
250 POKE36878,15:POKE36876,220:POKE36879,26
260 POKE162,0:WAIT162,64:POKE36878,0
270 PRINT"]NOT ABLE TO FIT IN    "W$(I)" PLEASE ENTER
280 PRINT"ANOTHER (TRY A SHORTERONE)."
290 INPUT"XWORD";W$(I):POKE36879,27:GOTO50
300 REM
310 T=0
320 FORI=1TON-1
330 IFW$(I)<W$(I+1)GOTO350
340 W$=W$(I):W$(I)=W$(I+1):W$(I+1)=W$:T=1
350 NEXT
360 IFT=1THEN310
370 TB$=CHR$(16)
380 CN=(80-2*X-2)/2:CN$=TB$+MID$(STR$(CN),2)
381 GR$=CHR$(8):TX$=CHR$(15):CR=CN+2*X
382 CR$=TB$+MID$(STR$(CR),2)
```

(listing continued on page 141)



A totally portable computer that runs on its own power supply for use anywhere.
It could mean the end of the rubber duck as we know it.
The HX-20 is a portable computer with a full size typewriter keyboard, LCD Virtual Screen, printer and micro-cassette facility actually built in. A computer with a rechargeable power source that's large enough for writing programs and manipulating data virtually anywhere, yet small enough to carry in a briefcase.
But don't let the size fool you. The HX-20 is not a gimmicky toy or an excuse for a calculator. It's a precision machine using a full extended version of Microsoft BASIC with 16k RAM, optionally expandable to 32k and 32k ROM expandable to 64k, RS-232C and Serial interfaces. The ASCII typewriter keyboard and five programmable keys brings ten separate program functions to your fingertips.
Power to your elbow.
The HX-20 runs on its own power supply for over 50 hours and can be easily recharged overnight, or whilst in use, with the ability to retain its memory in RAM even when switched off.
Keeping you in the picture.
The LCD screen is unique – showing any 20 characters by 4 lines at a time – enabling you to carry out word processing or data entry as if you are using a large screen.
Print Out. Built In.
The 24 column dot matrix impact micro-printer offers 42 LPM in a crisp, precise 5 x 7 matrix for perfect hard copies. Every time. And you can choose from a wide range of peripherals from bar code readers to acoustic couplers for total capability.
Epson. Reliability through Research.
You'll find our name on a highly successful range of computer printers. So you can be assured of the same quality and reliability through an extensive research programme prior to the launch of any Epson product.
Write or call us for further details and the name of your local stockist (because seeing really is believing).
You'll find that the HX-20 is the most complete portable computer you can buy. It could even change the face of bathtime.
Which is a bad day for ducks.
Epson (UK) Limited
Freepost
Wembley, Middlesex HA9 6BR
Freefone: 2730
Telex: 8814169
HX-20
PORTABLE COMPUTER
EPSON
Extraordinary product.
Exceptional quality.

Personal Software Services

Step into the unknown with

THE FUTURE MAKERS

Arcade Style Games for the ZX81 16K and Spectrum

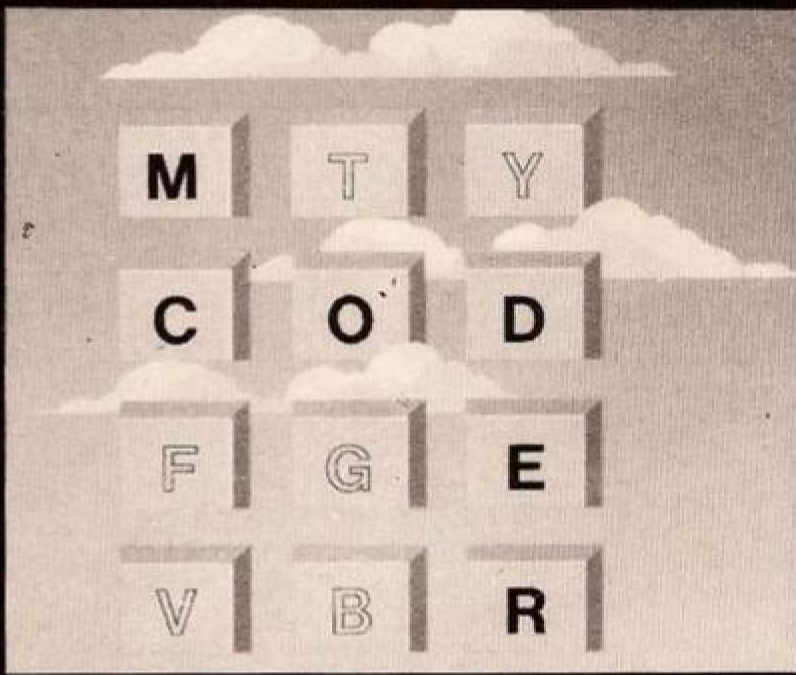
GHOST HUNT
Gobble your way through a maze - Ghosts, power pills etc. All machine code. Super fast action.
SPECTRUM 16-48K £4·95
ZX81 16K £3·95

MAZE DEATH RACE
Drive through a giant maze, 9 times the size of the screen, picking up points as you go - but watch out for the the other cars, rocks oil and ice. Superb machine code game. Highly recomended.
SPECTRUM 48K £4·95
ZX81 16K £3·95

KRAZY KONG
All machine code version of the popular arcade game. This program has all the features of the original and is every bit as fast. 3 different screens make it difficult to beat.
ZX81 16K £3·95

HOPPER
Entirely written in machine code, This excellent version of the arcade game is very addictive. See if you can get the frogs back to the lilly pond. (Available end of February 1983).
ZX81 16K £3·95

PSS makes Machine Code Redundant!



Now there is no need to spend long tedious hours writing and debugging your programs in laborious machine code - let MCoder from PSS do all the hard work for you....

MCoder is the first real integer compiler for The Sinclair Spectrum. This very sophisticated piece of software will simply translate basic programs into machine code for you, giving an average speed improvement of the order of 75 times although in certain cases the improvement can be as much as 900 times faster.

MCODER WAS DESIGNED TO BE AS SIMPLE AS POSSIBLE TO USE....

1. Load MCoder.
2. Write or load your basic program as normal.
3. RUN and debug your basic program
4. Compile your program using a single print USR command. If you have made a mistake MCoder will tell you exactly where, allowing you to correct it before it is too late.

As an additional feature basic programs can be compiled and "Stacked" above each other in memory - giving you true flexibility in your programming.

MCODER FOR THE SPECTRUM (16K or 48K) Costs only **8·95**

THE ZX81 VERSION IS ONLY **7·95**

Enter The PSS *COMPETITION

To show our faith in our product we are offering £1000 in prizes for the best Spectrum programs using MCoder. They can be GAMES, EDUCATIONAL, UTILITIES, in fact anything you care to write —The only restriction we make is that they must be written using MCoder.

1st. prize - £500

2nd. prize - A PORTABLE COLOUR TV VALUED AT £250

10 runners up - WILL EACH RECIEVE A PRIZE OF £25

WE ALSO GUARANTEE TO MARKET THE TWO WINNING PROGRAMS UNDER A ROYALTY AGREEMENT WITH THE AUTHOR. * CLOSING DATE 31st MAY. RESULTS WILL BE PUBLISHED IN SINCLAIR USER MAGAZINE. ENTRY FORM ENCLOSED WITH EVERY COPY OF MCODER.

SEND CHEQUE OR P.O. TO PSS 452 STONEY STANTON ROAD COVENTRY CV6 5DG.

(continued from page 138)

what you are typing so go slowly. Now type Run and Return. Now you have to input the size of the grid — the number of letters in X and Y directions, try 18,18 and press Return.

Next you are asked for the number of words: 20 is a reasonable amount. Then you type in the words, be careful if you have no screen. You will have to wait a while as it fits them in, if the screen border goes red it wants you to enter a different, preferably shorter, word. When it wants another input this will be the title. After typing that it prints the solution plus the puzzle and list of words. Press Y for another copy of the puzzle or press N for entering a different one.

Those with expansion fitted will have no difficulties. The printer used was the Seikosha OP-100VC.

(listing continued from page 138)

```
385 OPEN3,4
387 INPUT"TITLE";TL$
388 CT=INT(40-LEN(TL$)):CT$=TB$+MID$(STR$(CT),2)
389 PRINT#3,CHR$(14)"SOLUTION:":PRINT#3
390 FORJ=1TOY:FORI=1TOX:IFG$(I,J)=""THENPRINT#3," ";
395 PRINT#3,G$(I,J);:NEXT:PRINT#3:NEXT:PRINT#3:PRINT#3:PRINT#3
400 PRINT#3,CHR$(14)CT$TL$:PRINT#3,TX$
410 FORI=1TOX:FORJ=1TOY:IFG$(I,J)=""THENG$(I,J)=CHR$(FNR(26)+64)
420 NEXTJ,I
425 PRINT#3,CN$"/";:FORK=2TO2*X:PRINT#3,"-";:NEXT:PRINT#3,"\"GR$
430 FORJ=1TOY:PRINT#3,TX$CN$"|";:FORI=1TOX-1
440 PRINT#3,G$(I,J)" ";:NEXT:PRINT#3,G$(X,J)"|"GR$:PRINT#3,TX$CN$"|"CR$"|"GR$:NE
XT
441 PRINT#3,TX$CN$"\";:FORK=2TO2*X:PRINT#3,"-";:NEXT:PRINT#3,"/"
445 C1$=CHR$(16)+"25":C2$=CHR$(16)+"50"
446 PRINT#3:PRINT#3:PRINT#3,TX$
447 AB=INT(N/3+.5)+1
450 FORI=1TOAB:PRINT#3,W$(I)C1$W$(I+AB)C2$W$(I+AB*2):NEXT:PRINT#3:CLOSE3
460 PRINT"]ANOTHER COPY (Y/N)":POKE198,0
470 GETA$:IFA$<>"Y"ANDA$<>"N"THEN470
480 IFA$="Y"THENOPEN3,4:PRINT#3:GOTO400
490 RUN
500 DATA1,0,1,1,0,1,-1,1,-1,0,-1,-1,0,-1,1,-1
600 FORI=1TON
610 INPUTW$:IFW$=CHR$(13)THEN610
620 W$(I)=W$:NEXT:RETURN
```

Drumbeat

David Squires,
St Andrews,
Fife.

SPECTRUM

THIS SHORT program, written for either version of the ZX Spectrum, expands the idea of machine-code sound effects to produce a rhythm generator.

It is deliberately not too long or elaborate as this would mean losing some of the speed so essential to the program. The program itself suffers from the Spectrum's usual lack of volume but even without headphones or amplification, some fairly impressive rhythms can be produced.

You have two instruments at your command; the bass drum and side-drum with snare. When the program is run, it asks you for first the length of the note of the bass drum, then the length of the note of the snare drum. It then asks you for the number of bars the rhythm is to be played and finally the rhythm the machine is to play each bar. This is fed into the computer as a string of letters, with B for a note on the bass drum and S for a note on the snare drum. The other letter that can be input is P, for pause. Two or more can be written for longer pauses. Therefore BBSSPPSBBP would be read as two notes on the bass, then two on the snare, a short pause, another on the snare, two more on the bass and finally a very short pause.

Incidentally, if you are using headphones or amplification, the Mic socket gives a more faithful reproduction of the sound you hear from the Spectrum's own speaker but the Ear socket gives a sharper, louder, more percussive sound.

```
  10 REM ***Rhythm Generator****
  20 REM *For 16/48k ZX Spectum*
  30 GO TO 60
  40 POKE 32505,(b*t)/2: POKE 3
2507,1: LET c=USR 32500: RETURN
  50 POKE 32505,(s*t)/2: POKE 3
2507,0: LET c=USR 32500: RETURN
  60 CLEAR 32499
  70 GO SUB 200
  80 INPUT "Tempo(0-5)?";t
  90 INPUT "Lenth bass drum ?(0-
5)";b: INPUT "Lenth snare ?(0-5
)";s: LET s=s*5: INPUT "No. b
ars? ";b
 100 INPUT "Rhtym ";a$
 110 FOR k=1 TO b
 120 FOR v=1 TO (LEN a$)
 130 IF a$(v)="b" THEN GO SUB 40
 140 IF a$(v)="s" THEN GO SUB 50
 150 IF a$(v)="p" THEN PAUSE t+(
t=0)
 160 NEXT v: PAUSE t+(t=0): NEXT
k: STOP
 200 FOR a=32500 TO 32528
 210 READ n: POKE a,n: NEXT a
 220 DATA 6,1,197,33,15,1,17,1,0
,229,205,181,3,225,17,100,0,167,
237,90,125,254,255,32,237,193,16
,230,201
 230 RETURN
```

Millipede

M G Crossley,
Heywood,
Lancashire.

ACE

THIS PROGRAM is written in Jupiter Ace Forth. It is entitled Millipede and is based upon a program written by Andrew Weekes in Spectrum Basic published in *Your Computer,* February 1983. As there is a great shortage of Ace Forth software I hope Mr Weekes will not mind my using his algorithm.

I have tried to use descriptive colon definition names in an endeavour to make the coding self-explanatory. However, this is at the expense of memory and is not strictly necessary. The program as it stands occupies approximately 2K, 4 bytes, and requires a memory expansion to the Ace — I use a converted ZX-81 RAM pack. It may be possible, by cutting out the frills, to reduce the memory requirement and still have a playable game using the standard RAM only.

In the colon definition Once-More the word Millipede is used. At the time Once-More is being defined Millipede does not exist in the vocabulary. Therefore, it is necessary to define Once-More omitting Millipede and then when all the program has been typed in, edit Once-More putting Millipede in its correct position and then redefine Once-More. Anyone who has used the Ace for a short time will understand the procedure. A similar situation — recursion — is covered in the Ace manual chapter 3, exercise 7, page 53.

One interesting definition which I think is not covered in the Ace manual and which could be useful elsewhere is Screen-Peek. This colon definition expects the stack to contain the row, column print-head position and returns with the ASCII value of the character at the print-head position on top of the stack.

```
0 VARIABLE SEED

0 VARIABLE A

0 VARIABLE B

0 VARIABLE G

0 VARIABLE H

0 VARIABLE M

0 VARIABLE P

0 VARIABLE S

: SETUP
  7 A ! 23 B ! 0 G !
  0 M ! 15 P ! 0 S !
;

: LONG-DELAY
  20000 0 DO LOOP
;

: SHORT-DELAY
  200 0 DO LOOP
;

: 2DUP
  OVER OVER
;

: PRINT
  AT
  ." MILLIPEDE"
;

: RIGHT
  23 0 DO I DUP PRINT LOOP
;

: CENTRE
  23 0 DO I 11 PRINT LOOP
;

: LEFT
  23 0 DO I DUP 22 SWAP - PRINT LOOP
;

: TITLE
  10 0 DO CLS RIGHT SHORT-DELAY
  CLS CENTRE SHORT-DELAY
  CLS LEFT SHORT-DELAY
  LOOP CLS CENTRE
;
```

(continued on page 143)

DOWNSWAY

ELECTRONICS (UK) LTD.



MEMORIES FOR THE ZX81

The Downsway 64K Memory* slots directly on to the computer, without needing an additional power supply, or adding any extra load to the internal 5v regulator. Trade in your old 16K RAM Pack (any make, any age, any condition) for £12.50 against a Downsway 64K Memory to bring the price down to only **£47.45** plus p & p. Without trade-in, it costs just **£59.95** plus p & p — still incredible value!

If you only want 16K of memory for your ZX81, the Downsway 16K RAM Pack offers the same benefits of high quality and low price at only **£24.95** plus p & p.

Both memories measure only 2½ x 1½ x 1in. and are supplied with a foam cushion strip to provide added mechanical stability.

* Reviewed in ZX Computing Aug/Sept 1982 and Popular Computing Weekly 22/7/82.

MORE MEMORY FOR YOUR ZX81 OR SPECTRUM!

NEW! 32K RAM FOR SPECTRUM



A full 48K of memory for the 16K Spectrum — simple D.I.Y. installation by just undoing 5 screws and plugging in!

For Issue One machines (with light grey keys) — a RAM board of advanced design, using "state-of-the-art" technology — only **£42.50** plus p & p.

For Issue Two machines (with dark grey keys) — a simple plug-in kit of I.C.s which fit straight in to the sockets already provided: only **£32.50** plus p & p.

Both come with fully detailed, illustrated instructions.

Naturally Downsway add-on memories are fully tested and guaranteed, but should you be dissatisfied for any reason, just return the memory within 14 days for a full refund (and your old 16K RAM pack, where appropriate).

Please allow up to 28 days for delivery.

DOWNSWAY ELECTRONICS (UK) LTD. DEPT. M, DOWNSWAY HOUSE, EPSOM ROAD, ASHTEAD, SURREY.

Please send me:

Qty.	Item	Price	Total
	32K RAM Board (Issue 1 Spectrum)	£42.50	
	32K RAM Kit (Issue 2 Spectrum)	£32.50	
	64K Memory for ZX81 at trade-in price	£47.45	
	64K at normal price	£59.95	
	16K RAM	£24.95	
	Post & packing		£2.00
	Total		£

My cheque/P.O./Money Order is enclosed

Please debit my Barclaycard No. ....

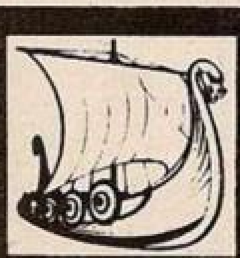
Name: ....

Address: ....

....

VISA

Viking Software



CBM 64 AND VIC 20 SOFTWARE FROM VIKING

***BASIC FRENCH** learn and test your knowledge of everyday basic French £5.95
***FRENCH TEST** now prove yourself and test your memory of common words and phrases £7.95
PONTOON gamble your money away in our casino with this favourite card game £5.95
DRAUGHTS the familiar board game for all the family £4.95
OTHELLO can you outwit the computer in this testing game of strategy **£4.95**
3D ESCAPE you have set the bomb on a time limit but can you escape through the corridors of the enemies castle £5.95
***STOCKETTE** cassette based stock control for the small business. Can produce printouts if required. Full cost & selling prices etc. £14.95
CODEMASTER break the hidden colour code set by the computer £5.95

*****CODEMASTER NOW AVAILABLE FOR THE ZX SPECTRUM*****

Please specify VIC 20 or CBM 64 when ordering.
**Requires a minimum of 8K extra RAM on VIC 20.*

Dealer enquiries welcome. Quality software produced and packaged by the experts.

Please make cheques payable to:
VIKING SOFTWARE
Unit 3 Meadow View Browston Lane, Browston, Gt. Yarmouth NR31 9DP

ZX SPECTRUM & ZX81 EDUCATIONAL SOFTWARE

Spectrum Junior Education **£5.50**

Use your Spectrum to help your children with their school work. This cassette contains eight attractive, easy-to-use programs for the 7 to 11 age group.

Topics include English comprehension, spellings, homophones, junior science, maths and history.

* Entering your own questions and answers allows you to adapt two of these programs for exercises in any subject area.
* Moving colour graphics and sound are extensively used to improve motivation.
* Use the "draw" program to produce pictures, maps and diagrams.

Suitable for the 16K or 48K Spectrum. Program notes are supplied.

O-Level Chemistry (C1) **£5.50**

This cassette contains four clearly presented revision/tutorial programs. The subject matter has been carefully structured to cover the most important aspects of:

* Elements, compounds and mixtures.
* Structure, bonding and properties.
* Redox, electrolysis and the activity series.
* Acids, bases and salts.

48K Spectrum and 16K ZX81 versions of the cassette are available. Please specify which you require.

Professional Computer Assisted Learning materials from:

CALPAC COMPUTER SOFTWARE
108 Hermitage Woods Crescent, St Johns, Woking, Surrey GU21 1UF.

Overseas orders: £6.50 ($11.60) per cassette; includes AIRMAIL postage.

(continued from page 141)

```
: HI-SOUND
  30 100 BEEP
;

: LOW-SOUND
  60 100 BEEP
;

: PAUSE
  BEGIN INKEY UNTIL HI-SOUND LOW-SOUND
;

: HARDNESS
  CLS CR CR
  ." Enter The Hardness Level (2-10)"CR
  QUERY LINE DUP DUP 11 < SWAP 1 > AND
  IF H ! 1000 0 DO LOOP
  ELSE DROP HARDNESS THEN
;

: INSTRUCTIONS
  CLS
  ." Hit any key to continue"CR CR
  ." Guzzle down the bugs"CR CR
  ." Without hitting the walls"CR CR
  ." Left 'Z'" 8 SPACES ." Right 'M'"CR
  PAUSE
;

: MIL
  60 189 102 165 102
  165 126 60 1
;

: BUG
  24 60 153 126 60
  255 60 219 2
;

: GRAPH
  8 * 11263 + DUP 8 +
  DO I C! -1 +LOOP
;

: DEF-GRAPH
  MIL GRAPH BUG GRAPH
;

: WALL-PRINT
  20 DUP A @ AT 46 EMIT
  B @ AT 46 EMIT
;

: RANDOMISE
  SEED @ 75 U* 75 0 D+
  2DUP U< - - 1- DUP SEED !
;

: RND
  RANDOMISE U* SWAP DROP
;

: BUG-PRINT
  10 RND 1+ 9 >
  IF 20 A @ DUP B @ SWAP
  - 2 / + AT 2 EMIT THEN
;

: SCREEN-PEEK
  AT 15388 @ C@
;

: ONCE-MORE
  CLS
  ." DO YOU WANT TO PLAY AGAIN"CR
  BEGIN INKEY ?DUP UNTIL DUP 121 =
  IF DROP MILLIPEDE
  ELSE 110 =
  IF CLS CR CR
  ." Bye for now."CR LONG-DELAY ABORT
  ELSE ONCE-MORE
  THEN THEN
;

: ENDIT
  CLS 9 0 DO
  ." YOU SNUBBED YOUR NOSE ON THE"CR
  ." TUNNEL WALL"CR LOOP LONG-DELAY CLS 6 0 AT
  ." You scored " S @ 10 / DUP .
  ." Points."CR CR
  ." You ate " G @ DUP .
  ." grubs"CR CR
  ." That's " + .
  ." in total" LONG-DELAY ONCE-MORE
;

: CHECK-OUT
  SCREEN-PEEK 46 =
  IF ENDIT THEN
;

: NOSE-SNUB
  15 P @ CHECK-OUT
  16 P @ CHECK-OUT
;

: G+
  G @ 1+ G !
;

: EAT-BUG
  16 P @ SCREEN-PEEK 32 = 0=
  IF G+ LOW-SOUND HI-SOUND THEN
;

: MIL-PRINT
  15 P @ AT 1 EMIT
;

: SCROLL
  22 32 AT 32 EMIT CR
;

: SUPDATE
  S @ 1+ S !
;

: MUPDATE
  H @ DUP RND SWAP 2 / - ?DUP
  IF 3 RND + M !
  ELSE MUPDATE THEN
;

: AUPDATE
  A @ DUP -1 >
  IF M @ + THEN A !
;

: BUPDATE
  B @ DUP 31 <
  IF M @ + THEN B !
;

: A2UPDATE
  A @ DUP 1 <
  IF M @ ABS + A ! B @ M @ ABS + B !
  ELSE DROP THEN
;

: B2UPDATE
  B @ DUP 28 >
  IF M @ ABS - B ! A @ M @ ABS - A !
  ELSE DROP THEN
;

: UPDATE
  SUPDATE MUPDATE AUPDATE BUPDATE
  A2UPDATE B2UPDATE
;

: MIL-CLEAR
  15 P @ AT 32 EMIT
;

: GETKEY
  INKEY DUP 122 =
  IF DROP P @ 1- P !
  ELSE 109 =
  IF P @ 1+ P ! THEN THEN
;

: MILLIPEDE
  SETUP TITLE HARDNESS INSTRUCTIONS
  DEF-GRAPH BEGIN WALL-PRINT BUG-PRINT
  NOSE-SNUB EAT-BUG MIL-PRINT SCROLL
  UPDATE MIL-CLEAR GETKEY 0 UNTIL
;
```

Blitzkrieg

Martin Exall,
Drayton,
Norwich.

ATOM

WRITTEN FOR a fully expanded Acorn Atom, this program uses high-resolution graphics and the characters which are defined are placed in the floating-point variable space. The program uses a machine-code routine to draw the characters on the screen. If you succeed in destroying all the buildings then the plane will land and then take off again for another go at a more difficult level. The program is written in subroutines and includes Rem statements so it should be fairly easily converted to other micros. The height of the buildings depends on the difficulty level which is set in line 3120 — the higher the number is, the higher the buildings can be. There are buildings all across the screen and they all have to be destroyed before the plane can land. Only six sections of the building can be destroyed with any one bomb.

```
 140 GOSUB 1000;REM MACHINE CODE
 150 GOSUB 2000;REM DEFINE CHARACTERS
 160 GOSUB 3000;REM INSTRUCTIONS
 170 GOSUB 4000;REM DRAW BUILDINGS
 180 GOSUB 6000;REM PRINT SCORE
 190 B=#8000;V=0;W=0;E=0
 200 IF ?#B001<128 OR E<>0 GOSUB 7000;
     REM BOMB DROP
 210 X=V;Y=W;C=9;GOSUB 5000
 220 V=V+1;B=B+1;IF V<32 GOTO 240
 230 W=W+1;V=0;B=#8000+W*256
 240 IF B=#951E GOTO 8000;REM LAND
 250 IF ?B<>0 GOTO 9000;REM CRASH
 260 X=V;Y=W;C=6;GOSUB 5000
 270 GOTO 200
 999 END
1000 REM MACHINE CODE
1010 REM TO PLOT CHARACTERS
1020 PRINT $21
1030 DIM ZZ(1),P(-1)
1040[
1050:ZZ0 LDX @0;LDY @0
1060:ZZ1 LDA (#82),Y;STA (#80,X)
1070 INY
1080 LDA #80;CLC;ADC @#20;STA #80
1090 LDA #81;ADC @0;STA #81
1100 CPY @8;BNE ZZ1
1110 RTS
1120]
1130 PRINT $6
1140 RETURN
2000 REM DEFINE CHARACTERS
2010 Z=#2800
2020 !Z=#7E5A7E5A;Z!4=#7E5A7E5A
2030 Z!8=#5A5A7E5A;Z!12=#7E5A5A7E
2040 Z!16=#7E667E66;Z!20=#7E667E66
2050 Z!24=#3C3C1818;Z!28=#7E5A7E24
2060 Z!32=#18183C3C;Z!36=#5A7E5A3C
2070 Z!40=#18181818;Z!44=#7E667E3C
2080 Z!48=#C0800000;Z!52=#003F7FFE
2090 Z!56=#3C183C7E;Z!60=#183C7E7E
2100 Z!64=#7078381C;Z!68=#60707070
2110 Z!72=0;Z!76=0
2120 Z!80=#2A26221C;Z!84=#1C2232
2130 Z!88=#08081808;Z!92=#1C0808
2140 Z!96=#1C02221C;Z!100=#3E2020
2150 Z!104=#0C02221C;Z!108=#1C2202
2160 Z!112=#3E140C04;Z!116=#040404
2170 Z!120=#023C203E;Z!124=#1C2202
2180 Z!128=#3C20201C;Z!132=#1C2222
2190 Z!136=#0804023E;Z!140=#202010
2200 Z!144=#1C22221C;Z!148=#1C2222
2210 Z!152=#1E22221C;Z!156=#1C0202
2220 RETURN
3000 REM INSTRUCTIONS
3010 PRINT $12
3020 PRINT "            BLITZ"''
3030 PRINT "YOU ARE IN AN AEROPLANE FLYING  "
3040 PRINT "OVER A LOT OF BUILDINGS. YOU    "
3050 PRINT "HAVE TO FLATTEN THE BUILDINGS BY"
3060 PRINT "DROPPING BOMBS ON THEM SO YOU   "
3070 PRINT "CAN LAND ON THE GROUND."''
3080 PRINT "YOU DROP THE BOMBS BY PRESSING  "
3090 PRINT "THE shift KEY."''
3100 PRINT '"    PRESS ANY KEY WHEN READY"
3110 LINK #FFE3;REM WAIT FOR KEYPRESS
3120 D=5;REM DIFFICULTY
3130 S=0;REM SCORE
3140 RETURN
4000 REM DRAW BUILDINGS
4010 CLEAR 4
4020 FOR Z=2 TO 29
4030 C=ABSRND%3
4040 FOR H=21 TO (21-(ABSRND%D+1)) STEP -1
4050 X=Z;Y=H;GOSUB 5000;REM PLOT CHARACTER
4060 NEXT H
4070 C=C+3
4080 X=Z;Y=H;GOSUB 5000
4090 NEXT Z
4100 MOVE 0,15;DRAW 255,15
4110 RETURN
5000 REM PLOT CHARACTER
5010 ?#83=#28
5020 ?#82=C*8
5030 ?#81=#80+Y
5040 ?#80=X
5050 LINK ZZ0
5060 RETURN
6000 REM PRINT SCORE
6010 STR S,540
6020 Z=0
6030 DO
6040 C=540?Z;C=C-38
6050 X=10+Z;Y=23
6060 GOSUB 5000
6070 Z=Z+1
6080 UNTIL 540?Z=CH"."
6090 RETURN
7000 REM DROP BOMB
7010 IF E=1 GOTO 7030
7020 E=1;F=V;G=W;I=B;J=0
7030 X=F;Y=G;C=9;GOSUB 5000
7040 G=G+1;I=I+256
7050 IF ?I<>0 AND ?I<>255 J=J+1;S=S+1;X=F;Y=G;
     C=9;GOSUB 5000
7060 IF G=22 OR J=6;E=0;GOSUB 6000;RETURN
7070 X=F;Y=G;C=7;GOSUB 5000
7080 RETURN
8000 REM LAND
8010 FOR Z=0 TO 5
8020 PRINT $7
8030 NEXT Z
8040 DO
```

(continued on next page)

(continued from previous page)

```
8050 X=V;Y=W;C=9;GOSUB 5000
8060 V=V+2;IF V>31 V=0
8070 W=W-1
8080 X=V;Y=W;C=6;GOSUB 5000
8090 UNTIL W=0
8100 D=D+2
8110 GOTO 170
9000 REM CRASH
9010 V=V-1;B=B-1;DO
9020 X=V;Y=W;C=8;GOSUB 5000
9030 FOR Z=0 TO 10;WAIT;NEXT Z
9040 X=V;Y=W;C=9;GOSUB 5000
9050 W=W+1;B=B+256
9060 UNTIL ?B<>0 OR ?(B+256)=255
9070 X=V;Y=W;C=8;GOSUB 5000
9080 FOR Z=0 TO 120;WAIT;NEXT Z
9090 PRINT $12
9100 PRINT ''''"                you crashed"''
9110 PRINT "YOU SCORED "S''
9120 INPUT "DO YOU WANT ANOTHER GAME"$540
9130 IF ?540=CH"Y";GOTO 160
9140 IF ?540<>CH"N";PRINT $11;LINK #FE22;GOTO 9120
9150 END
>
```

Multiline delete

Chris Dellarocas,
Athens,
Greece.

ZX-81

THE LACK of a Delete command in ZX-81 Basic has been in my opinion a major shortcoming in a machine where the lack of Data/Read, the lack of a machine-code monitor and the limitations of memory have been forcing programmers to create and then line-by-line delete lengthy loaders and initialisers. Just think of the initialisation program of Simon Lane's Dog Race — *Your Computer* July 1982. It comprises 126 lines.

Such reasons have prompted me to write the Multiline Delete routine. It just takes 54 bytes and can be used without problem in both 1K and 16K systems, in Fast or Slow mode. The routine deletes any number of any program lines — including line 0 — contained between two given line numbers — Poked to locations FirstL and LastL, see programs. While — and this is most important — conserving all existing Basic variables.

The routine is relocatable with no changes to be made when moving it up or down in memory. The only point needed to be taken into account is the locations of the two words FirstL and LastL. I consider it more useful to move it above RAMtop and have it sit there during Loads and Saves. That is why I have written an optional relocator occupying 12 more bytes. You can easily omit that if you wish to do so.

The routine is written around two very useful ROM routines. The first, starting at 09D8H, returns the starting address of a given Basic line in HL and is used to determine the limits of the block of memory that is to be deleted. The second, starting at 09ADH, changes all pointers — that is, system variables between DFile and STKend — that do not point lower than HL, by adding them to the value in BC.

I have written a short Basic program to load, lines 100-150, relocate, lines 10-20, drive the routine and also demonstrate some of its features.

Create a 1 Rem statement with 66 full stops, and then type POKE 16510,0 and key in the Basic program. Now type Run and enter the hex code. When you have finished and checked it, type Cont and start your cassette recorder. The program will be Saved under the name Vel and then automatically Run. Lines 10-20 will relocate the Del routine to 7F00, while lines 30-70 will use the same routine to delete unwanted lines 0-199. When you now List, you will find yourself left with lines 900 onwards. Type Goto 9000 to discover that A$ has been kept intact. You can now use the program through the Basic driver — lines 9988-9999 — and its operation should present no problems. However, you should note some of the following points: you do not have to enter the exact starting and finishing lines of the block you want deleted.

The routine usually — but not always — causes the Basic program from which it is called to halt the report code.

Under normal operation the program cannot crash. But never enter a first line number larger than the very last line of the resident Basic program. Also, avoid last line numbers larger than 16382. First line numbers should never be larger than last line numbers.

1K users will probably want to leave the routine sitting in the Rem statement. Also, they will have to change the locations of FirstL and LastL in memory by changing their references in the hex listing — locations 16523-24 respectively.

Calling addresses are:

USR 16514 for the Del routine if not moved
USR 16568 for the Relocator

```
START:16514         LENGTH:54
DEL:
 LD HL,(FIRSTL)          2A BC 7F
 CALL 09D8H              CD D8 09
 PUSH HL                 E5
 PUSH HL                 E5
 LD HL,(LASTL)           2A BE 7F
 INC HL                  23
 CALL 09D8H              CD D8 09
 EX DE,HL                EB
 LD HL,(DFILE)           2A 0C 40
 AND A                   A7
 SBC HL,DE               ED 52
 JR NC,NOLAST            30 04
LAST:
 LD DE,(DFILE)           ED 5B 0C 40
NOLAST:
 LD HL,(E-LINE)          2A 14 40
 PUSH HL                 E5
 AND A                   A7
 SBC HL,DE               ED 52
 PUSH HL                 E5
 POP BC                  C1
 EX DE,HL                EB
 POP AF                  F1
 POP DE                  D1
 PUSH AF                 F5
 LDIR                    ED B0
 EX DE,HL                EB
 POP DE                  D1
 AND A                   A7
 SBC HL,DE               ED 52
 PUSH HL                 E5
 POP BC                  C1
 POP HL                  E1
 JP 09ADH                C3 AD 09

FIRSTL=32700
LASTL=32702

RELOCATOR FOR ABOVE PROGRAM
START:16568         LENGTH:12

RELOC:
 LD HL,4082H             21 82 40
 LD DE,7F00H (*)         11 00 7F
 LD BC,036H              01 36 00
 LDIR                    ED B0
 RET                     C9

(*) DESTINATION ADDRESS-CAN BE
CHANGED TO YOUR REQUIREMENTS.

   0 REM E LN **  FAST FAST E
7LN **  FOR E£RND  GOSUB ?K  GOS
UB ?£RNDE=RND FAST   GOSUB ? FAS
T AT FOR LET SGN PRINT GOSUB   F
OR SGN   GOSUB ? FAST AT LPRINT
? 5 RND)   0  GOSUB  TAN
   1 REM (C) CHR. DELLAROCAS
             ATHENS GREECE
   3 LET A$="54 BYTES OF M/CODE
ARE ENOUGH   TO ALLOW YOU DELETE
 ANY NUMBER  OF PROGRAM LINES WH
ILE >>NOT<<  DESTROYING THE EXIS
TENT BASIC   VARIABLES."
   4 REM [illegible]
   5 IF PEEK 16514<>42 THEN GOTO
 100
  10 POKE 16389,127
  20 LET Q=USR 16566
  30 POKE 32700,0
  40 POKE 32701,0
  50 POKE 32702,200
  60 POKE 32703,0
  70 LET Q=USR (127*256)
  99 REM [illegible]
 100 FOR X=16514 TO 16579
 110 INPUT A$
 120 POKE X,CODE A$*16+CODE A$(2
)-476
 130 PRINT A$;"  ";
 140 NEXT X
 150 STOP
 198 SAVE "DEL"
 199 RUN
9000 PRINT A$,,,,
9987 REM [illegible]
9988 LET FL=32700
9989 LET LL=32702
9990 PRINT "DELETE FROM ";
9991 INPUT A
9992 POKE FL,A-256*INT (A/256)
9993 POKE FL+1,INT (A/256)
9994 PRINT A;" TO ";
9995 INPUT B
9996 POKE LL,B-256*INT (B/256)
9997 POKE LL+1,INT (B/256)
9998 PRINT B
9999 LET Q=USR (127*256)
```

Sound editor

J W Harrison,
Wigan,
Lancashire.

ATARI

SOUND EDITOR for the Atari 400/800 runs in 16K and uses the variables: V, N, D, L, where V is the Voice or sound channel selected, N the note, D the distortion factor and L the loudness or volume. A green pointer is used to indicate the last selection keyed in. The program allows for either one voice or all four to be used singularly or together.

To switch off any voice, key in:

V,0,0,0

where V is the voice to be switched off: for example

Sound 1,0,0,0

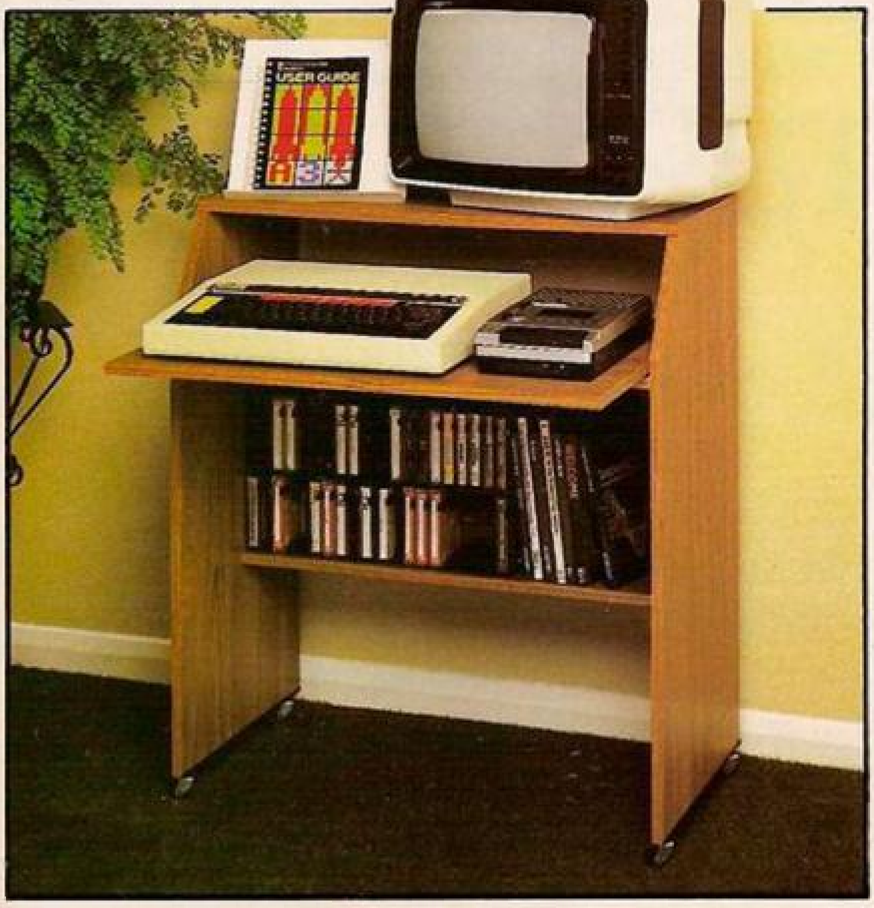
switches off voice 1.

Atari users can refer to the hardware manual for further guidance in the use of distortion as some combinations of V, N, D, L will cancel out to produce silence. The program is self-explanatory as it runs and Rem statements in the listing help explain how it is put together.

```
10 REM << SOUND EDITOR >>
15 REM * by J.W.Harrison *
16 REM ** SET UP TITLE PAGE **
20 GRAPHICS 17
30 POSITION 3,4
40 ? #6;"*** SOUND ***"
50 POSITION 3,8
60 ? #6;"*** EDITOR ***"
70 POSITION 3,12
80 ? #6;"PRESS [START]"
90 POSITION 5,14
100 ? #6;"TO BEGIN"
110 SOUND 0,66,12,8:SOUND 1,60,12,8
```

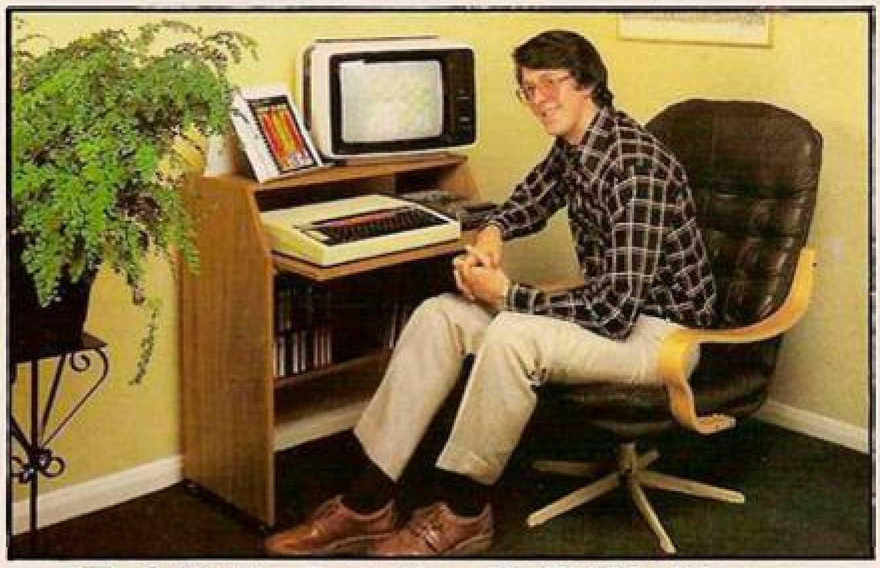
(continued on page 149)

THE IDEAL HOME FOR YOUR HOME COMPUTER



The System Care Desk - made specially for home computer systems. Designed as a neat, smart piece of furniture for your home.

£49·95



Exhibited at the P.C.W. Show and the Northern Computer Fair

And now including design features based on our discussions with home computer users. Send for yours TODAY.

- Supplied as a flat-pack. Easily assembled. Full instructions provided.
- Smart teak effect finish.
- All cables can be neatly and safely 'hidden.'
- Ergonomically designed. Sliding shelf positions the keyboard at the right distance from the screen to suit you. Slides away after use. Saves space.
- Easi-glide castors allow you to move your computer installation where you want it.
- Houses computer, disk drive / cassette recorder and monitor, with ample space for tapes, books etc.

Overall height - 0.83m.
Computer shelf height - 0.70m.
Width - 0.70m.
Depth (with shelf closed) - 0.38m.

system care
At home with your computer.

***NOW* AVAILABLE TO YOU BY MAIL ORDER DIRECT FROM THE SUPPLIER.**

Micro Aids, 2 Boston Close, Culcheth, Warrington, WA3 1BR

4-WAY MINIATURE MASTER PLUG



Provides you with just one 13 amp mains input for up to four 6 amp max outputs to a total loading of 13 amp. Tidy. Safe. Fully insulated.

£8·95

(Only available with orders for the System Care Home Computer Desk).

ORDER BY FREEPOST - send the coupon or order in writing along with your cheque or postal order in an envelope - no stamp needed. Please allow up to 28 days for delivery. And there's a 14-day money back option, in the event that you're not fully satisfied with your purchases.



To: Micro Aids, FREEPOST, 2 Boston Close, Culcheth, Warrington, WA3 1BR

ORDER

QTY	ITEM	ITEM PRICE	TOTAL
____	System Care Desk	£49.95	____
____	4-Way Master Plug	£8.95	____
		Post / Pkg	£4.95

I enclose a cheque/postal* order payable to Micro Aids for £ ____

* Please delete as applicable.

Signature ____

PLEASE PRINT
Name: Mr/Mrs/Miss: ____

Address ____

____ Tel: ____

FREEPOST - no stamp needed. Prices apply to U.K. only. Export prices on application.

At last. A range of software that's as well designed as the Dragon 32.

Six months ago, most computer users thought a Dragon was something out of an adventure game.

How times change. Nowadays, it's almost impossible to pick up a computer magazine without reading some new tribute to the Dragon 32.

THE FIRST FAMILY COMPUTER

We called it the first family computer. And we believe that much of its success derives from the fact that it has been superbly designed for the job it has to do.

Design that incorporates 32K RAM of memory at a real value-for-money price level.

Design that utilises the advanced 6809E microprocessor.

Plus a range of features that help make the world of computers accessible to first-time users. Like colour drawings. 5 octaves of music.

And plenty of power and versatility to keep up the interest as your experience increases.

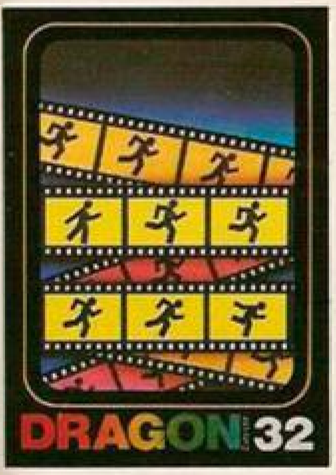
SOFTWARE TO MATCH

Designing a range of software that does justice to the Dragon was a task we approached with as much care as designing the computer itself.

The results are now available - games, educational programs, hints on programming - conceived by some of the best software houses in the world, to help users get even more out of their machines.



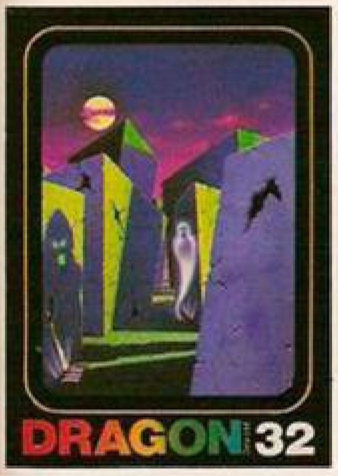
*TV not included in price.



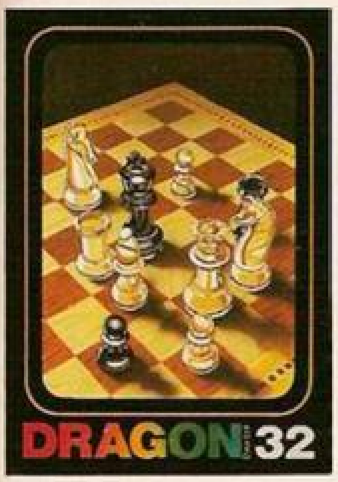
Graphic Animator. A cassette that makes use of the Dragon's ability to draw on the screen. It shows you how to create simple cartoons - then bring them to life.



Personal Finance. This cassette allows you to keep track of all the family's finances, from bills to bank statements.



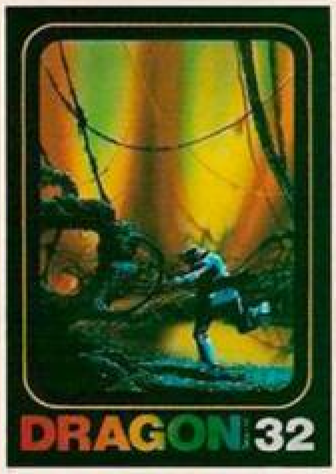
Ghost Attack. On cartridge. You're in a maze, and you must find your way out. But you're not alone - you're pursued by ghosts!



Chess. A great partner to play against again and again - with one major drawback. It's very hard to beat. Test yourself against nine different levels. On cartridge.



Typing Tutor. Only a keyboard as sophisticated as the Dragon's could allow you a program like this. You use the Dragon's own keyboard to learn to type. On cassette.



Cave Hunter. Finding the hidden gold is hard. But surviving the attacks of malevolent creatures may well prove to be impossible. Cave Hunter is on cartridge.



Dragon Selection. A cassette of utility programs, allowing you to create your own database. Write your own tunes - or learn other language vocabularies.



Starship Chameleon. A cartridge game. You find yourself under attack by the dreaded Gabolators! Their task is to take your planet - yours is to protect it.



Computavoice. This cassette actually enables your Dragon to speak to you.

These are just some of our titles, and every month, we'll be adding more and more.

What you get out of a computer depends on what you put in. And with a Dragon 32 and Dragon software, there's enough challenge and satisfaction for anyone. But then, that's what it's designed for.

DRAGON 32

The first family computer.

Make much more of your computer!

16k RAM Cartridge for VIC-20

Non switchable



£35

while stocks last

More sound from your ZX Spectrum!

Echo

Not only more sound, but better sound and a wide range of other facilities!
Control Volume, and adjust tone of sound!
Load and Save without switching leads!
Audible cue facility for tape programs!
DIN compatibility!
No additional power supply needed!
Attractively cased – looks good
– SOUNDS GOOD!
Only £23.50



More memory for your Jupiter Ace

Pacer

New

The uniquely expandable 16K RAM pack

Similar concept to ZX-PANDA but for the incredible Jupiter Ace.
Attractive, solidly built 16K RAM pack with the facility of expanding to 32K by plug-in module.
For more power to faster FORTH . . .
you need a PACER!

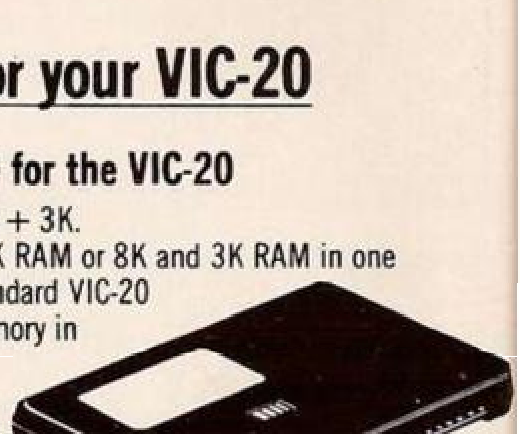
16K Expandable RAM £29.95
16K Expansion Module. £19.95



More memory for your VIC-20

Vixen RAM Cartridge for the VIC-20

Switchable between 16K or 8K + 3K.
Gives you the option of full 16K RAM or 8K and 3K RAM in one package. When added to a Standard VIC-20 gives 16384 bytes of extra memory in memory blocks 1 and 2 or 3092 bytes of extra memory into the 3K memory block AND 8192 bytes of extra memory switchable between memory blocks 1 and 3.
Fully compatible with available motherboards/modules.
Simply plugs into the rear expansion port of computer.
No re-addressing of existing BASIC programs needed. **Only £44.95**



Tandem

Expandable Expansion System for the VIC-20

Gives 4 expansion slots for VIC-20 cartridges.
Custom-designed case. Plugs directly into computer. Further expanded by using TANDEM System!
ROM socket for expansion.
No extra power supply needed.
Only £34.95



To: Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants. Telephone: (0252) 318260.
Please forward me the following products:

. . . .

. . . .

All prices are inclusive of VAT, Post & Packing for U.K. deliveries (overseas add 15%)

Name: . . . .

Address: . . . .

. . . .

STONECHIP ELECTRONICS

"more ways to make more of your computer"

Y

DEALER ENQUIRIES WELCOME Delivery approx 14 days

(continued from page 144)

```
115 REM ** CHECK FOR [START] BEING PRESSED **
120 IF PEEK(53279)<>6 THEN 120
130 SOUND 0,0,0,0:SOUND 1,0,0,0
135 REM ** SET UP GRAPHICS 1 WITH TEXT **
140 GRAPHICS 1
150 ? "SELECTION WILL BE DISPLAYED ABOVE---"
160 ? "WHICH VOICE (0-3)";:INPUT V
170 IF V>3 THEN 160
175 REM ** CLEAR TEXT: PRESS [ESC],THEN
176 REM PRESS [CTRL] AND [CLEAR] TOGETHER **
180 ? "}":REM ** CLEAR TEXT **
190 ? "NOTES GO FROM HIGH(0) TO LOW(255)-"
200 ? "WHICH NOTE (0-255)";:INPUT N
210 IF N>255 THEN 200
220 ? "}":REM ** CLEAR TEXT **
230 ? "DISTORTION EFFECTS VARY (EXPERIMENT)-"
235 ? "EVEN NUMBERS ONLY---"
240 ? "WHAT DISTORTION (0-14)";:INPUT D
245 IF D>14 THEN 240
250 ? "}":REM ** CLEAR TEXT **
260 ? "VOLUME RUNS FROM OFF(0) TO LOUD(15)-"
270 ? "HOW LOUD (0-15)";:INPUT L
280 IF L>15 THEN 270
285 REM ** DISPLAY SELECTION TO GRAPHICS SCREEN **
290 IF V=0 THEN POSITION 0,0
300 IF V=1 THEN POSITION 0,4
310 IF V=2 THEN POSITION 0,8
320 IF V=3 THEN POSITION 0,12
329 REM ** TYPE sound IN INVERSE VIDEO **
330 ? #6;"sound ";V;",";N;",";D;",";L;"    "
331 REM ** 4 SPACES BETWEEN LAST QUOTE MARKS **
340 SOUND V,N,D,L
345 REM ** COLOR 28 SELECTS GREEN POINTER
346 REM ** COLOR 0 ERASES IT. POINTER USED
347 REM ** TO INDICATE LAST SELECTION KEYED
350 COLOR 0:PLOT 18,0:PLOT 18,4:PLOT 18,8:PLOT 18,12
360 IF V=0 THEN COLOR 28:PLOT 18,0
370 IF V=1 THEN COLOR 28:PLOT 18,4
380 IF V=2 THEN COLOR 28:PLOT 18,8
390 IF V=3 THEN COLOR 28:PLOT 18,12
400 ? "}":REM ** CLEAR TEXT **
410 GOTO 160:REM ** RETURN FOR NEXT SELECTION **
420 END
```

Memory display

I K Biddle,
Nuneaton,
Warwickshire.

BBC

A J HYNDS' program, December *Your Computer*, is quite a useful idea for memory display but has two distinct disadvantages. First, it requires about a page of user memory, and secondly Page must be altered in order to prevent the initial program being overwritten. I wrote this machine-code program with these considerations in mind. The program uses no memory allocated to the user since it is located in disc space at &D00. The assembled program requires about 225 bytes in &D00 and five bytes at &70.

To use the program type

RUN <CR>

and wait until the prompt returns. Then type

CALL 5% <CR>

The program should then wait until a four-digit hex number is input. It it does not, re-check the listing.

In order for the program to operate, all leading zeros must be input. Scrolling is achieved by pressing Shift and to exit, press Escape. The program can be called from Basic and trapped with the statement:

ON ERROR GOTO . . .

when the user presses Escape. The display format can be changed by altering line 820 to read

JSR &FFE7

All error checking has been made and will not accept alphanumerics outside the range 0-9 and A-F. Incidentally, the location at &D7 returns a non-ASCII value of a keyboard input and Escape is the value 240.

```
40FORI=0TO1:P%=&D00:
  S%=P%:[OPTI*3
50.INP   LDX#0
60.LP1   LDA M%,X
70       CMP#&D
80       BEQ get
90       JSR &FFEE
100      INX
110      BNE LP1
120.get  LDY#0
130.LP2  LDX#0
140.LP3  JSR &FFE0
150      CMP#71
160      BCS LP3
170      CMP#58
180      BCC CH2
190.CH1  CMP#64
200      BCC LP3
210      JMP CH3
220.CH2  CMP#47
230      BCC LP3
240.CH3  JSR &FFEE
250      STA &70,X
260      LDA &70,X
270      CMP#&40
280      BCS SUB
290      CLD
300      SEC
310      SBC#&30
320      STA &70,X
330      JMP OK
340.SUB  CLD
350      SEC
360      SBC#&37
370      STA &70,X
380.OK   CPX#&01
390      BEQ MUL
400      INX
410      BNE LP3
420.MUL  CLC
430      CLD
440      LDX#&0F
450      LDA &70
460.LP4  ADC &70
470      DEX
480      BNE LP4
490      ADC &71
500      STA &73,Y
510      CPY#&01
520      BEQ PNT
530      INY
540      BNE LP2
550.PNT  LDA#14
560      JSR &FFE3
570      LDA#12
580      JSR &FFE3
590      JSR &FFE7
600      JSR &FFE7
610      LDX &73
620      LDY &73
630      STY &81
640      LDY &74
650      STY &80
660.LP5  TXA
670      JSR &8570
680      TYA
690      JSR &856A
700      LDA(&80),Y
710      JSR &856A
720      LDA(&80),Y
730      CMP#&20
740      BCS LP6
750      LDA#&20
760      JMP LP7
770.LP6  CMP#&7E
780      BCC LP7
790      LDA#&20
800.LP7  JSR &FFEE
810      LDA#&20
820      JSR &FFEE
830      LDA &D7
840      CMP#&F0
850      BEQ LP8
860      INY
870      BNE LP5
880      INC&81
890      INX
900      BNE LP5
910.LP8  RTS:]
920M%=P%+1:$M%=CHR$12+
   "Type in start
   address (Hex.) "
930NEXT
```

Forth connection

P Sharp,
Maidstone,
Kent.

ATOM

THIS IS Connect Four for the Acorn Atom in 2K — 0.5K of this is graphics. The object is to get a row of four counters in a grid. This is done by using the Repeat key to move across the top and Shift to drop the counter. There are sound effects, a score of each game won and alternate goes.

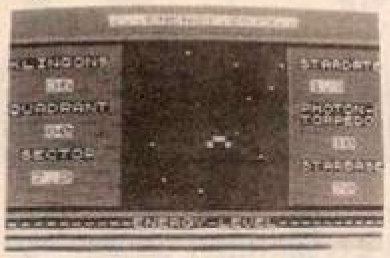
The computer tells you whose move it is and inverts two counters on the winning line when a person has won.

```
10E=0;L=0;@=0;F=1
20CLEAR0
30IN."INSTRUCTIONS Y/N"V;IFV=Y GOS.x
40DIMAA14;I=0
50I=I+1;AA(I)=0;IF I<13 G.50
60CLEAR0;A=0;D=0;H=0;G=0;T=#0F;U=#18;S=#40;Z=0;I=0
70P.$12"   O WINS "E"    :    X WINS "L;?#801B=S;?#801C=S
80I=I+1;AA11=#801F+I;?AA11=#F0;IFI<32 G.80
90I=0
100 I=I+1;A=A+1;B=#8064+A;?B=#F0;IFI<14 G.100
110A=A-20;D=D+64;A=D;IFD<>448 I=0;G.100
120I=0
130I=I+1;H=#8064+G;?H=#FF;G=G+32;IF I<16 G.130
140Z=Z+2;G=Z;IFG <>16 I=0;G.130
150IF F=1 X=U;G.170
160aX=T;O=#8F
170AA12=AA12+1;IFAA12=43 G.w
180?#8043=X;?#8134=X;?#8136=#14
190?#8137=T;?#8139=#0D;?#813A=T;?#813B=#16;?#813C=#05
200I=0
210I=I+1;AA13=#8155+I;IF I<8 G.210
220bI=0
230IF(?#B002)&64<>64G.260
240IF?#B001<>#FF G.c
250G.230
260IFQ=2;?C=S
270C=#8045+I;I=I+2;?C=X;Q=2;WAIT;IFI=14G.b
280G.230
290cIFC=#8043G.b
300 IF C=#8045 M=6-AA2;AA2=AA2+1;G.h
310 IFC=#8047 M=6-AA3;AA3=AA3+1;G.h
```

(continued on page 151)

ALL NEW!

Just £4.95!



New SPACE TREK

All the features of the favourite 'Star Trek' game plus graphic warp drive and arcade type klingon shoot-out make this program a must for the dedicated 'trekker'.

New slimmer, lighter RAM Pack for the ZX81—no wobble problems, and completely reliable—fully printer compatible.



Only £26.50!

Buy the two together as a budget pack for only £29.95!

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

Other JRS FAST LOADING 16K Programs for the ZX81

£4.95 GAMES II—3 arcade-style machine code programs (City Bomb, 3-D Battle, Gridball).

£4.95 LOST ISLAND—An absorbing adventure program in which you are shipwrecked on a desert island.

£5.95 GRAPHICS TOOLKIT—22 machine-code routines that enable you to considerably improve the screen displays in your own programs. ('Good value for money' ZX Computing Sept/Oct Issue).

£4.95 BATTLESHIPS—The classic game of Battleships and Cruisers—You verses the ZX81.

TO JRS SOFTWARE LTD, 19 WAYSIDE AVENUE WORTHING, WEST SUSSEX BN13 3JU

Qty.	Item	Price	Total
	BUDGET PACK	£29.95	
	JRS 16K RAM Pack	£26.50	
	SPACETREK	£4.95	
	GAMES II	£4.95	
	LOST ISLAND	£4.95	
	BATTLESHIPS	£4.95	
	GRAPHICS TOOLKIT	£5.95	
☐ Please tick for free catalogue		Total £	

(Note all prices include VAT, p&p)

I enclose Cheque/Postal order/Money order* for £ ______ made payable to JRS SOFTWARE LTD

Mr/Mrs/Miss ______

Address ______

*Delete as applicable

ST. GEORGE AND THE DRAGON

Software for the Dragon 32

Can you slay the fire breathing Dragon? Can you cross the slippery bridge and smite the magic stone to lift the curse from the castle and its beautiful maidens? Don't get roasted by the Dragon, and mind the river and pond. If you fall in, your armour will send you to a watery martyrdom. Using sound, the program also pushes the Dragon high resolution to its full capabilities. For joysticks only.

Only £6.95. Send to:

COMPUTER RENTALS LIMITED
DEPT. YC
140 Whitechapel Road
London E1
Telephone: 01-247 9004

DEALER ENQUIRIES WELCOME

RD
DIGITAL
TRACER
LAST CHANCE
TO ORDER DIRECT
AT INTRODUCTORY
PRICE OF
£49.95
(inc P&P.
VAT)

The RD Digital Tracer - featured in Your Computer, January 1983, - gives you instant transfer of pictures and designs to ZX Spectrum and ZX 81. The introductory price of £49.95 must end soon!

The RD Digital Tracer is supplied with tracing sheet, software cassette and full instructions on use. For delivery within 28 days, send £49.95 (payable to RD Laboratories Ltd) to Dept T at:

R D Laboratories Ltd

20 Court Road Estate Cwmbran Gwent NP44 3AS Cwmbran (06333) 74333

(Offer applies to UK only)
Send stamp and address for details of the RD 8100 Modular Interface System for automatic monitoring, test and control.

(continued from page 149)

```
320 IFC=#8049 M=6-AA4;AA4=AA4+1;G.h
330 IFC=#804B M=6-AA5;AA5=AA5+1;G.h
340 IFC=#804D M=6-AA7;AA7=AA7+1;G.h
350 IFC=#804F M=6-AA8;AA8=AA8+1;G.h
360 IFC=#8051 M=6-AA9;AA9=AA9+1;G.h
370G.160
380hIFM<1G.230
390I=0;A=0;A=A+M
400I=I+M;?C=S;C=C+64;?C=X;P.$7;A=A-1;IF A=0G.u
410G.400
420C=#8043;IFX=U;G.a
430X=U;O=#98;G.170
440xP.$12"    CONNECT 4"'"     ---------"
450P.''"TO WIN GET A LINE OF o \ x.IN A "
460P."VERTICAL,HORIZONTAL OR DIAGERNALLINE"
470P.''"CONTROLS"''"rept TO MOVE"
480P.'"shift TO DROP COUNTER"''"two players only";A=0
490A=A+1;WAIT;IFA<530G.490
500R.
510w?#8134=#93;?#8135=#94;?#8136=#81;?#8137=#8C;?#8138=#85
520?#8139=#8D;?#813A=#81;?#813B=#94;?#813C=#85
530LI.#FB7D;IN.''"ANOTHER GO Y/N"R;IFR=N;G.570
540IFAA14=0 F=1;AA14=1;G.40
550IFF=1 AA14=0;F=0;G.40
560F=1;G.40
570E.
580IF X=T AA14=1
590IF X=U AA14=2
600u?C=X;I=0
610I=I+1;W=C;Y=0
620IF I=1 N=62
630IF I=2 N=66
640IF I=3 N=2
650IF I=4 N=64
660W=W+N
670IF ?W=X A.Y<>3 Y=Y+1;G.660
680IFY=3 G.r
690 IFW<>X G.710
700G.660
710N=-N;W=C
720W=W+N
730IF?W=X A.Y<>3 Y=Y+1;G.720
740IFY=3 G.r
750IFI<5G.610
760G.420
770rW=W-N;I=0
780 ?W=0;?C=0;A=#8139
790I=I+1;?A=S;A=A+1;P.$7;IFI<9G.790
800?#8136=#17;?#8137=T;?#8138=#0E
810IFX=T E=E+1;G.530
820IFX=U L=L+1;G.530
```

Bone idle

W A Googe,
Stevenage,
Hertfordshire.

ZX-81

THIS IS a program for a 16K RAM ZX-81. It is widely recognised that the prime function of a computer is to make life easier for us all, but to program one to play Patience for you must be the ultimate in laziness. My excuse is that the computer can play faster than me, and it does not cheat. The game is Clock Patience, and the program should be entered and Run.

In reply to the L cursor the following data should be input, one number at a time, reading the data across the page. Follow each entry with Newline, and if correctly done, the last entry will produce a message 9/10.

Data: 3, 20, 2, 21, 1, 22, 0, 23, 6, 23, 5, 24, 4, 25, 3, 26, 10, 24, 11, 24, 10, 26, 11, 26, 15, 23, 16, 24, 17, 25, 18, 26, 18, 20, 19, 21, 20, 22, 21, 23, 18, 15, 19, 15, 20, 15, 21, 15, 18, 10, 19, 9, 20, 8, 21, 7, 15, 7, 16, 6, 17, 5, 18, 4, 10, 6, 11, 6, 10, 4, 11, 4, 6, 7, 5, 6, 4, 5, 3, 4, 3, 10, 2, 9, 1, 8, 0, 7, 3, 15, 2, 15, 1, 15, 0, 15, 12, 15, 11, 15, 10, 15, 9, 15, End of data.

List the program and delete lines 1 to 10 inclusive, by typing Line Number Newline. Do not use Run or Clear, or you will lose the data you have just entered, which is a list of the print positions for the cards.

You will need a copy of this exciting program, so get your recorder into a recording mood, type Goto390, start the recorder, and press Newline, the program will Autorun.

The computer will shuffle the cards and set them out in a clock-face pattern on the screen — it deals at random from a new pack each time which amounts to the same thing. Should the computer succeed in getting the game to come out, it will stop with message 9/380 and Cont Newline will start it off again.

If it fails, it will display the Ace that stopped it in the bottom left of the screen, and after a pause try again. Remember this is a program with hidden data stored within it, so to restart from a listing use Goto 11.

The computer plays at about two games per minute, and if such haste makes you dizzy, an extra line:

265 PAUSE 100

will slow things down a bit, or if you dislike the screen jump caused by Pause there is room for a dummy loop at that part of the program. On the other hand, if your patience is limited delete line 175, and insert:

222 SLOW

This will speed things up by not displaying the cards until after they have been set out.

The computer starts play with the top card from the one o'clock pile. If you wish it to start in the centre, change line 230 to read:

LET X = 13

and alter the first subscript of the arrays in line 370 to read 13 also.

If desired, the program can be altered to delete line 335. Replace it with:

235 PRINT AT (20 + 1 ** 1),0;D$
236 PRINT AT (20 + 1 ** 1),0;" " (two spaces)

This will cause the card in the bottom left of the screen to flash, and demonstrate a novel use of the ** function to cause a slight delay — a good idea gleaned from somebody else's program, and deserving to be more widely known.

```
   1 DIM C$(13,4,2)
   2 DIM A(13,4,2)
   3 DIM T(13)
   4 FOR N=1 TO 13
   5 FOR M=1 TO 4
   6 INPUT A(N,M,1)
   7 INPUT A(N,M,2)
   8 NEXT M
   9 NEXT N
  10 STOP
  11 FAST
  12 RAND
  15 LET A=1
  20 LET K=13
  30 LET Q=12
  40 LET J=11
  50 LET T=10
  60 LET B$="AS2S3S4S5S6S7S8S9ST
SJSQSKSAD2D3D4D5D6D7D8D9DTDJDQDK
DAC2C3C4C5C6C7C8C9CTCJCQCKCAH2H3
H4H5H6H7H8H9HTHJHQHKH"
  70 FOR N=1 TO 13
  75 LET T(N)=4
  80 FOR M=1 TO 4
  90 LET P=INT (RND*LEN B$)+1
 100 IF P/2-INT (P/2)=0 THEN GOT
O 140
 110 LET C$(N,M)=B$(P TO P+1)
 120 LET B$=B$( TO P-1)+B$(P+2 T
O )
 130 GOTO 160
 140 LET C$(N,M)=B$(P-1 TO P)
 150 LET B$=B$( TO P-2)+B$(P+1 T
O )
 160 NEXT M
 170 NEXT N
 175 SLOW
 180 FOR N=1 TO 4
 190 FOR M=1 TO 13
 200 PRINT AT A(M,N,1),A(M,N,2);
"█"
 210 NEXT M
 220 NEXT N
 225 LET R=0
 230 LET X=1
 240 LET Y=T(X)
 250 PRINT AT A(X,Y,1),A(X,Y,2);
""
 260 LET D$=C$(X,Y)
 270 LET T(X)=T(X)-1
 280 LET X=VAL C$(X,Y,1)
 285 LET Y=T(X)
 300 IF Y=0 THEN GOTO 330
 310 PRINT AT A(X,Y,1),A(X,Y,2);
D$
 315 LET R=R+1
 317 IF R=51 THEN GOTO 370
 320 GOTO 260
 330 FOR N=1 TO 100
 335 PRINT AT 21,0;D$
 340 NEXT N
 350 CLS
 360 GOTO 11
 370 PRINT AT A(1,4,1),A(1,4,2);
C$(X,Y)
 380 STOP
 385 GOTO 11
 390 SAVE "CLOCK"
 400 GOTO 11
```

Music maestro

Roger Keatley,
Wolverhampton.

DRAGON

THE PROGRAM allows the user to enter, modify, insert, play, load and save a piece of music. The standard Dragon music symbols are entered into a line where each symbol may be separately addressed. Music is entered using the E command in the form:

E(START)/(TEXT)

Where Start is the first position to place a symbol and Text the string to use — can be more than one symbol. If you enter on an existing symbol Modify is effected. Symbols can be inserted into the line using the I command in the form:

I(START)/(TEXT)

Where Start is the position to start on and Text the symbols to be inserted there are no default values for these commands. They should be entered in full. The music string can be played using the P command as follows:

P(LINE NUMBER)

Where Line Number is the line to play — 20

(continued on next page)

(continued from previous page)

lines are available. Leaving the line number off will cause the Dragon to play all the lines entered.

The L command changes the line number which music is entered into. Use:

L = (LINE NUMBER)

Do not leave the line number off. The command New removes all the symbols from the lines. Use this to start again. When you have completed your masterpiece you can save it on to tape using the Save command:

SAVE/(FILENAME)

Where Filename is the name you want to call the piece. Similarly Load can be used to get the file back from tape:

LOAD/(FILENAME)

As the program does not test the symbols entered you must make sure what you enter is a valid Dragon symbol. If it is not the program will halt when you try to play the symbol. If this does happen you can recover by entering Goto 50 — this will restart the program. You can then change the offending symbol.

If you have been running a high-resolution graphics program before using this one, switch the Dragon off, then on again before loading this one, as the program uses PClear1 to save memory.

```
10 ' DRAGON32 MUSIC WRITER
20 '
30 PCLEAR1:CLEAR2000:DIM M$(20)
40 CL=1
50 CLS
60 PRINT:PRINT:PRINT
70 PRINT@72,1:PRINT@82,2:PRINT@92,3
80 FOR T=1 TO 3
90 FOR C=1 TO 9
100 PRINTUSING "#";C;
110 NEXT C
120 PRINTUSING"#";0;
130 NEXTT
140 PRINTUSING"##";12;
150 PRINT@10,"LINE: ";CL
160 PRINT@128,M$(CL)
170 PRINT@288,STRING$(30," ")
180 PRINT@192," "
190 PRINT
200 PRINT"INPUT COMMAND STRING"
210 LINE INPUT "  >";C$
220 IF LEFT$(C$,1)<>"P" THEN 290
230 F=0
240 IF LEN(C$)>1 THEN F=1:PN$=RIGHT$(C$,(LEN(C$)-1))
250 IF F=1 THEN PN=VAL(PN$):PLAY M$(PN):GOTO 150
260 FOR C=1 TO 20:MX$=MX$+M$(C):NEXT C
270 PLAY MX$:MX$="":GOTO 150
280 '.....ENTER......
290 IF LEFT$(C$,1)<>"E" THEN 400
300 PC=INSTR(2,C$,"/")
310 PN=VAL(MID$(C$,2,PC-2))
320 IN$=RIGHT$(C$,(LEN(C$)-PC))
330 B$=LEFT$(M$(CL),PN-1)
340 B$=B$+IN$
350 IF PN>=LEN(M$(CL)) THEN 370
360 B$=B$+(RIGHT$(M$(CL),LEN(M$(CL))-(PN+LEN(IN$)-1)))
370 M$(CL)=B$
380 GOTO 150
390 '...CHANGE LINE......
400 IF LEFT$(C$,2)<>"L=" THEN 450
410 CL=VAL(RIGHT$(C$,(LEN(C$)-2)))
420 IF CL>20 THEN PRINT:PRINT" 20 LINES ONLY !!":CL=1:SOUND180,17
430 PRINT@352,STRING$(32," ")
440 GOTO 150
450 '...SAVE..???????
460 IF LEFT$(C$,4)<>"SAVE" THEN 570
470 F$=RIGHT$(C$,(LEN(C$)-5))
480 PRINT:PRINT"PRESS ENTER WHEN RECORDER READY"
490 IF INKEY$="" THEN 490
500 PRINT:PRINT"OUTPUT OF "F$" IN PROGRESS"
510 OPEN "O",#-1,F$
520 FOR C=1 TO 20
530 PRINT #-1,M$(C)
540 NEXT C
550 CLOSE #-1
560 GOTO 40
570 IF LEFT$(C$,4)<>"LOAD" THEN 690
580 F$=RIGHT$(C$,(LEN(C$)-5))
590 PRINT:PRINT"PRESS ENTER WHEN RECORDER READY"
600 IF INKEY$="" THEN 600
610 PRINT"   INPUT IN PROGRESS"
620 OPEN "I",#-1,F$
630 PRINT"FILE: "F$" FOUND AND LOADING"
640 FOR C=1 TO 20
650 INPUT #-1,M$(C)
660 NEXT C
670 CLOSE #-1
680 GOTO 40
690 IF C$<>"NEW" THEN 710
700 RUN
710 '...INSERT.....
720 IF LEFT$(C$,1)<>"I" THEN 810
730 PC=INSTR(2,C$,"/")
740 PN=VAL(MID$(C$,2,PC-2))
750 IN$=RIGHT$(C$,(LEN(C$)-PC))
760 B$=LEFT$(M$(CL),(PN-1))
770 B$=B$+IN$
780 B$=B$+RIGHT$(M$(CL),(LEN(M$(CL))-PN+1))
790 IF LEN(B$)>32 THEN GOSUB 820:M$(CL)=LEFT$(B$,32) ELSE M$(CL)=B$
800 GOTO 150
810 SOUND180,19:GOTO 150
820 PRINT:PRINT"  >> TRUNCATION <<":SOUND180,20
830 PRINT@352,STRING$(15," ")
840 RETURN
```

Box spin

W Meadowcroft,
High Crompton,
Oldham.

LYNX

THE EXCELLENT graphics capabilities of the 48K Lynx are demonstrated by this program, which draws the visible sides of a rotating 3-D box. If lines 230, 250, 270 and 290 are omitted, then a skeleton frame of the box is drawn. If line 180 is omitted, geometrical patterns are built up. Here is a list of the variables:

- A = Maximum width of sides
- B = Maximum width of ends
- T = Angle of turn
- D = Current width of sides
- P = Current width of ends
- S = Perspective
- W = Reduction in width of sides
- F = Reduction in height of ends

```
100 LETA = 100
110 LETB = 25
120 FORT = 0 TO 360 STEP 10
130 LETD = A * COS (RAD(T))
140 LETP = B * SIN (RAD(T))
150 LETS = 2 * P/3
160 LETW = ABS(S/4)
170 LETF = D/25
180 CLS
190 INK2
200 MOVE 128,70
210 DRAW 128,180
220 INK7
230 IFP<0 THEN GOTO 250
240 PROC ENDA
250 IF D-W<W-D THEN GOTO 270
260 PROC SIDEA
270 IF P>0 THEN GOTO 290
280 PROC ENDB
290 IF D+W>- (D+W) THEN GOTO 310
300 PROC SIDEB
310 PAUSE 5000
320 NEXT T
330 RUN
340 DEFPROC SIDEA
350 MOVE 128+D-P-W, 150+S+F
360 DRAW 128-D-P+W, 150-S+F
370 DRAW 128-D-P+W, 100+S-F
380 DRAW 128+D-P-W, 100-S-F
390 DRAW 128+D-P-W, 150+S+F
400 ENDPROC
410 DEFPROC ENDA
420 MOVE 128+D-P-W, 100-S-F
430 DRAW 128+D+P+W, 100-S+F
440 DRAW 128+D+P+W, 150+S-F
450 DRAW 128+D-P-W, 150+S+F
460 DRAW 128+D-P-W, 100-S-F
470 ENDPROC
480 DEFPROC SIDEB
490 MOVE 128-D+P-W, 100+S+F
500 DRAW 128+D+P+W, 100-S-F
510 DRAW 128+D+P+W, 150+S-F
520 DRAW 128-D+P-W, 150-S-F
530 DRAW 128-D+P-W, 100+S+F
540 ENDPROC
550 DEFPROC ENDB
560 MOVE 128-D+P-W, 100+S+F
570 DRAW 128-D-P+W, 100+S-F
580 DRAW 128-D-P+W, 150-S+F
590 DRAW 128-D+P-W, 150-S-F
600 DRAW 128-D+P-W, 100+S+F
610 ENDPROC
```

Extra colours

Patrick Hill,
Walsall.

DRAGON

THIS PROGRAM was devised to produce more colours on the Dragon 32. It forms colours by drawing alternate lines of two colours, the numbers of which are contained in C and C1. This gives about 30 usable background colours which will support the usual graphics commands. I have used Draw for the alternate lines though Line works equally well.

```
10 CLS0
20  FOR A = 0 TO 1
30 PMODE3,1:SCREEN1,A:PCLS
40  FOR C = 1 TO 4
50  FOR C1 = 1 TO 4
60 P = 1
70  IF P + C1 = C THEN P = P + (C
     1 + 1)ELSEP = P + C1
80  FOR J = 1 TO 196 STEP 2
90  DRAW "BM0," +  STR$ (J)
100  DRAW "C" +  STR$ (C) + "M252
     ," +  STR$ (J)
110  DRAW "BM0," +  STR$ (J + 1)
120  DRAW "C" +  STR$ (C1) + "M25
     2," +  STR$ (J + 1)
130  NEXT J
140 CIRCLE(128,96),75,P
160 PA INT (128,90),P,P
170  FOR K = 1 TO 1000: NEXT K
180 PCLS1
190  NEXT C1
200  NEXT C
210  NEXT A
```

■

NOW . . . FOR ZX SPECTRUM USERS EVERYWHERE
THE FULLER BOX . . .



A NEW DIMENSION IN SPECTRUM CAPABILITY

It's easy to see why the ZX Spectrum is outselling all the other small colour computers, it really is a marvel of new technology. Equally marvellous is the new 'Fuller Box' for your Spectrum. Sound Quality is improved enormously with the built in *Audio Amplifier* which works with all Spectrum programs. *The Sound Synthesiser* will make any sound you want to design: explosions, laser blasts, trains, birds etc. It's based on the popular G1-AY-3-8912 chip, and is supplied with a demo program. Finally, the *Joystick Port* enables you to use any low-priced Atari/Commodore joysticks with your programs.

The Fuller Box fits neatly on to the back of your ZX Spectrum, and does not interfere with any peripherals, including the new Spectrum microdrives.

PRICE (INC. VAT)
£29.95 + 80p p&p

But the story doesn't end there! The Fuller Box has been designed to perform many other functions, and extra, expanded versions are already available.

The Fuller Orator An amazing Speech Synthesiser which can be programmed to say anything you command, using the keyboard or demo cassette. It uses the GI SP0256 AL voice synthesiser chip; and comes complete with the Fuller Box.

£39.95 + 80p p&p (inc. VAT)

Fuller Sound Amplifier Box, including Audio Amplifier (non-expandable) **£6.95** + 80p p&p (inc. VAT)

Fuller Orator upgrade kit – to fit inside Fuller Box **£24.95** (inc. VAT) (postage free, does not include Fuller box)

Fuller 'Master Unit'– including Orator, synthesiser, amplifier and Joystick port in Fuller Box

£54.95 + 80p p&p (inc. VAT)

Fuller FD42 System NOW FOR ZX81 or ZX SPECTRUM



This famous, best selling product immediately converts your ZX Computer into a sturdy, attractive and professional unit, with full size typewriter keyboard. A tough plastic case encloses the keyboard, P.C.B. and power supply. It has 42 keys including all the ZX81/Spectrum graphic characters printed on them. The full travel key switches have gold plated contacts and guaranteed life of 10^6 operations. IT'S SO EASY TO INSTALL! You simply unscrew the ZX PCB from its case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required.

NOW ALL ONE PRICE! £29.95 (inc. VAT) + £2.50 p&p

16K Spectrum Expansion Module – to fit into back of Fuller case – **£24.95** (inc. VAT & p&p).

RAM Adaptor Board – enables you to fit 16K Expansion inside Fuller case – **£9.75** (inc. VAT & p&p).

Fuller FDS Keyboard for the ZX81 or ZX Spectrum

Our new advanced keyboard has the same, fine specifications as the FD42 system, but with a new, re-designed case, space bar and double-sized shift and enter keys. A must for the discerning ZX81 or Spectrum user.

SPECIAL LOW PRICE £39.95 (inc. VAT) + £2.50 p&p.

Fuller ZX Spectrum Upgrade Pack

16K Spectrum owners – upgrade to 48K with a Fuller Spectrum Upgrade Pack – Complete vith full assembly instructions. Model 2 or 3 only. **£34.95** (inc.VAT) p&p FREE!

COMPUTER DEALERS!

Contact us for a Special Fuller Introductory Pack. We are looking for dealers throughout the U.K!

Fuller MICRO SYSTEMS

Mail to: **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2.
Telephone: 051-236 6109

Please supply the following items:

ITEM	QUANTITY	PRICE	POSTAGE	TOTAL

I enclose cheque/p.o. ☐
Or, please debit my Access/Barclaycard No.______

Name______

Address______

Please send me further details, I enclose S.A.E. ☐

YC4 83

Virgin

Games

'Ere! What's your GAME?

- **Turn your programs into gold – with Virgin Games, a new computer software company, part of the Virgin Group and backed by all its resources.** Our expertise is in marketing, merchandising and sales – in fact in all the aspects of turning software into cash.
- **So, we are searching for exciting, entertaining and original programs (from software houses or individual programmers) for the following home computers – Atari, BBC, Commodore 64 and VIC 20, Dragon, ORIC 1, Sinclair ZX Spectrum and Texas Instruments 99/4A.**
- If you have written a games program with good graphics, lots of action and an original concept and you want to be rich and famous – but you don't have the resources to market it properly yourself – send a cassette copy to **Nick Alexander, Virgin Games, 61/63 Portobello Road, London W11.** We will evaluate it and if we believe that it has good commercial potential, we will offer you a contract for it.
- **We are also forming a team of first-class free-lance machine code programmers. If you are interested drop us a line with an example of your work.**
- **When sending us programs to evaluate, make sure that you enclose your name, full address and phone number, operating instructions and details of the computer it runs on.** Make sure you keep a copy of the program yourself.
- **We will only be taking on a limited number of programs so don't delay!**

Virgin Games Ltd, 61/63 Portobello Road, London W11. Tel: **01-221 7535.**

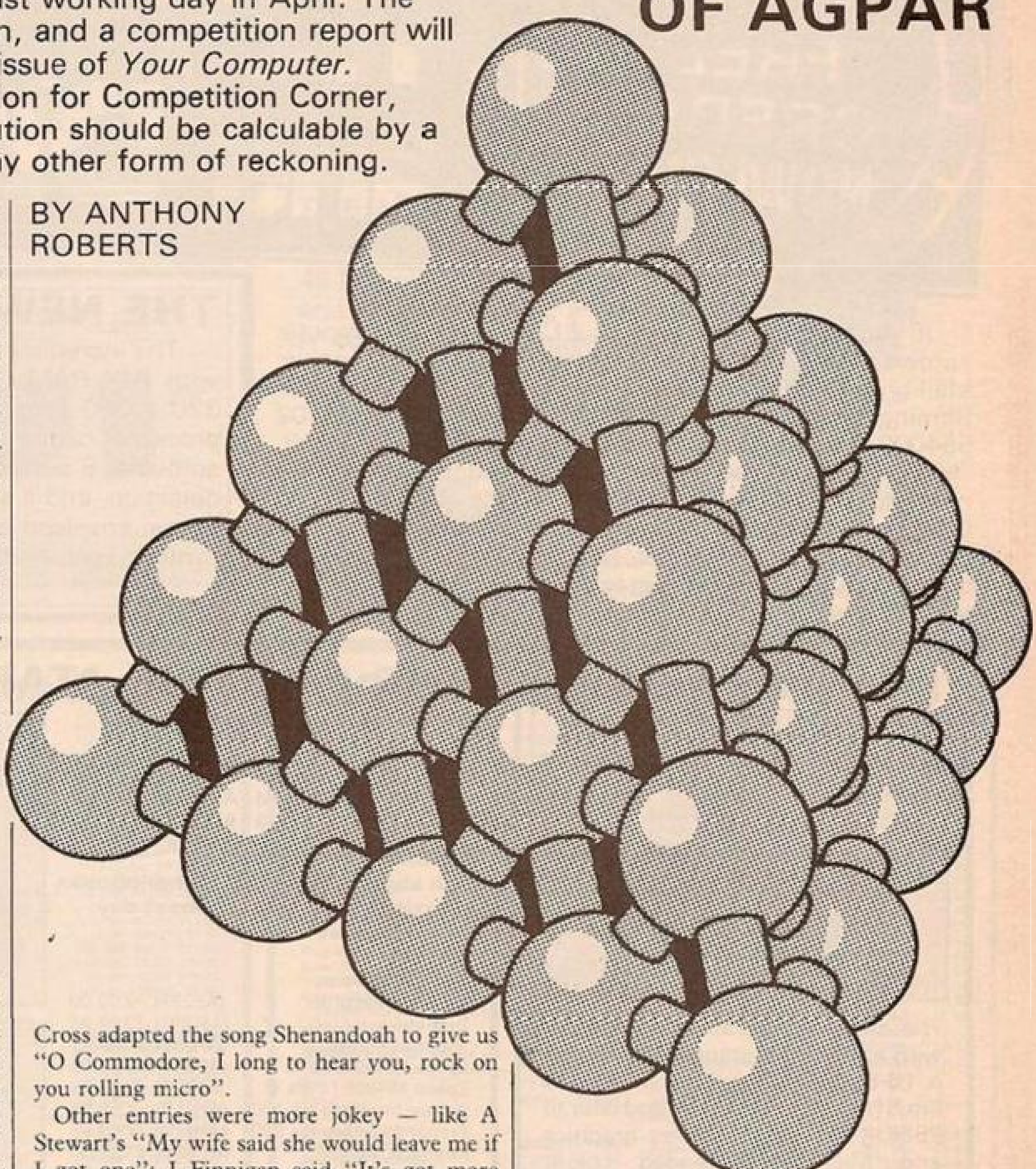
COMPETITION CORNER

A £15 book token will be awarded to the first correct solution drawn from the competition bag. All entries must be at the *Your Computer* offices by the last working day in April. The name of the winner, the solution, and a competition report will be published in the June, 1983 issue of *Your Computer.*

If you want to set a competition for Competition Corner, remember that the simplest solution should be calculable by a short program rather than by any other form of reckoning.

THE PYRAMID OF AGPAR

BY ANTHONY ROBERTS



AT THE bottom of the Agpar Sea lies the massive, millennia-old Globe Pyramid — a structure bristling with solar-powered defences, but which contains the last remaining matrix-stones — just what you need to teleport off Agpar before it is swallowed up by the black hole which has all but consumed Agpar's twin suns. There will be only 24 hours to gather as many stones as you can after the suns are finally extinguished, turning off the Pyramid's defences. You can only pray that you can gather enough!

The Globe Pyramid is a tetrahedron in shape — a pile of 35 globes on a triangular base, five to an edge. Each globe is connected to its immediate neighbours via a closed tube, and one stone is to be found at each end of each tube. Once inside a globe, you can gather all the stones from the ends of the tubes leading into it: but it takes an hour to break through a tube, and six hours to break into a globe from the outside. How many stones can you get?

Competition results

THERE WAS a large number of entries for February's competition to win a Commodore 64 — but no obvious winner. The sentence to be completed was: "a Commodore 64 allows me to do so much more . . .". Many entries called for musical accompaniment: "I'll still need it, I'll still feed it, when I'm sixty four" was M Clark's version of the Beatles lyric. E Cross adapted the song Shenandoah to give us "O Commodore, I long to hear you, rock on you rolling micro".

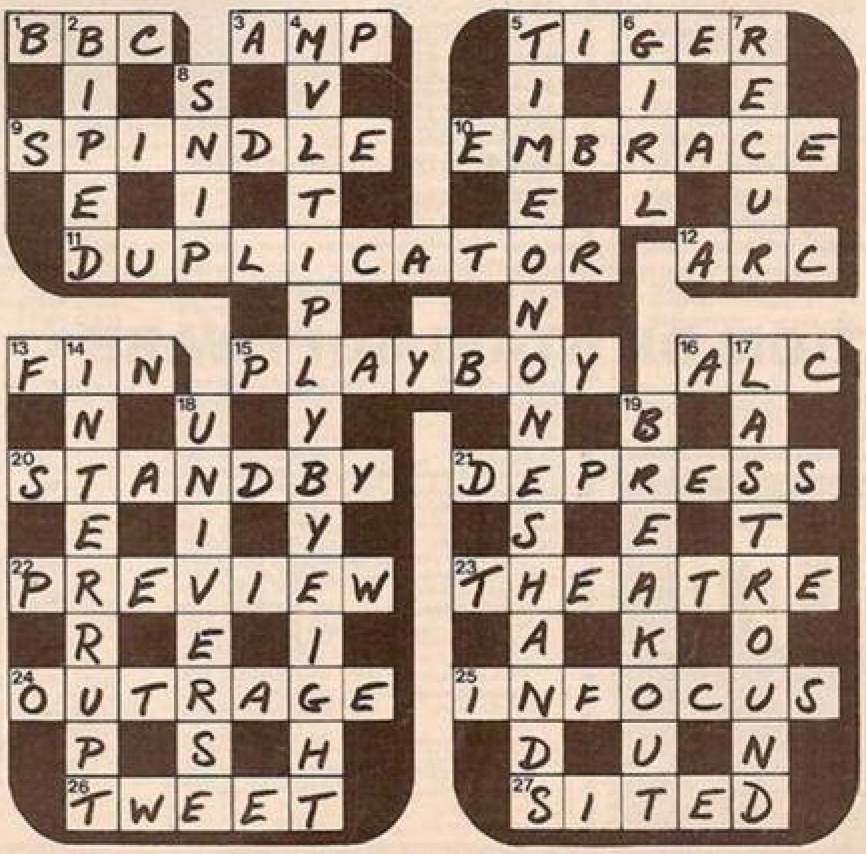
Other entries were more jokey — like A Stewart's "My wife said she would leave me if I got one"; J Finnigan said "It's got more bytes than a ship's cat hosting a flea convention". Rob Munday was refreshingly direct with "Reasons! Why do you always want reasons! Just send the computer" while the Rev D Tordoff made the special plea that "VICars need much bigger memories — without the temptation of Apples".

The 64's relation to the rest of the Commodore family was a common theme. P Farey confided "A Pet can be so restricting, don't you think?" and P Birch suggested that "It's 64 of one and half a cousin of a Pet".

These were all in the running but after much deliberation we awarded the prize to W Bellini, 27 Edgecombe Park Drive, Crowthorne, Berkshire, who turned the sentence into a near-limerick with "colourful sprites, and sound that delights keep programs from being a bore".

The solution to the Orb Bomb Puzzle was that three twists were the minimum number required to defuse the bomb. A Scott, 55 Huntley Grove, Peterborough, PE1 2QW, did not supply a program solution but explained that it was much easier to consider the bomb as a two-by-two by two Rubik's cube. Several other entries took the same approach. ■

Solution to the February crossword which offered a Commodore 64 as the prize.





INTEREST FREE CREDIT NOW! ON:-

Atari, VIC20, and Dragon

If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

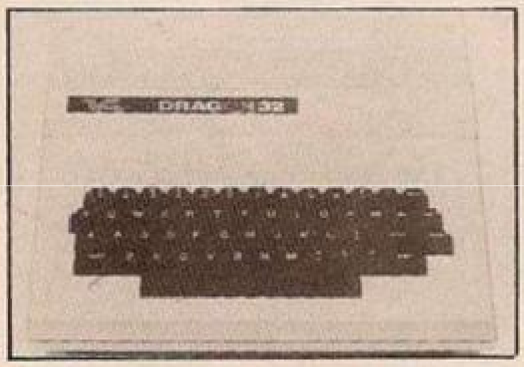
You pay 10% down, then 10% per month for a further nine months (to nearest penny). Example: Atari 400 48K. Cash price £299. Credit terms: £29.90 down, then £29.90 per month for nine months. Total £299. Credit quotations on request. This offer subject to approval which can take up to 48 hours.

THE NEW COMMODORE 64

The incredible new computer from Commodore comes with 64K RAM fitted! Plus 16 colours hi-res graphics, 320 x 200 pixels, 40 columns by 25 lines, Z80 micro processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collision detection, and a sound generator with 3 voices, 4 wave-forms, envelope and filter to rival some dedicated music synthesisers. And all this at the most incredible price ever.

(AF56L) Only £339.00

DRAGON 32



The amazing new British computer with a full-travel standard keyboard, a 16-bit microprocessor, 32K RAM fitted (expandable to 64K and later to 256K!!), 9 colours, hi-res graphics and Microsoft extended colour BASIC (the very best BASIC to learn with). It can be used with virtually any ordinary cassette recorder, it has a printer interface (Centronics-type), joysticks are available and it's incredible value for money.

(AF57M) Only £199.50.

Lots of new Dragon software available.

THE AMAZING ATARI COMPUTERS

4 Consoles Available:
Atari 400, 16K RAM (AF36P) £199.95
Atari 400, 48K RAM (AF37S) £249.00
Atari 800, 16K RAM (AF02C) £399.00
Atari 800, 48K RAM (AF55K) £440.00

★All above with BASIC & handbooks Carriage free, delivery next day by Datapost

Other hardware:

Cassette Recorder	(AF28F)	£50.00
Disk Drive	(AF06G)	£299.95
Thermal Printer	(AF04E)	£199.95
Epson MX80T Mk III	(AF38R)	£399.95
Epson MX80F/T Mk III	(AF40T)	£447.35
Printer Interface for 400	(AF41U)	£59.95
Printer Interface for 800	(AF42V)	£59.95
Interface Module	(AF29G)	£135.00
Versawriter	(AF43W)	£199.95
16K RAM Module	(AF08J)	£55.00
48K RAM Module for 400	(AF44X)	£99.95
48K Upgrade for 400	(AF45Y)	£75.00
Floppy Disk	(YX87U)	£2.50
Le Stick	(AC45Y)	£24.95
Joystick Controllers (Pair)	(AC37S)	£13.95
Paddle Controllers (Pair)	(AC30H)	£13.95





For full details ask for our hardware leaflet (XH54J) SAE appreciated

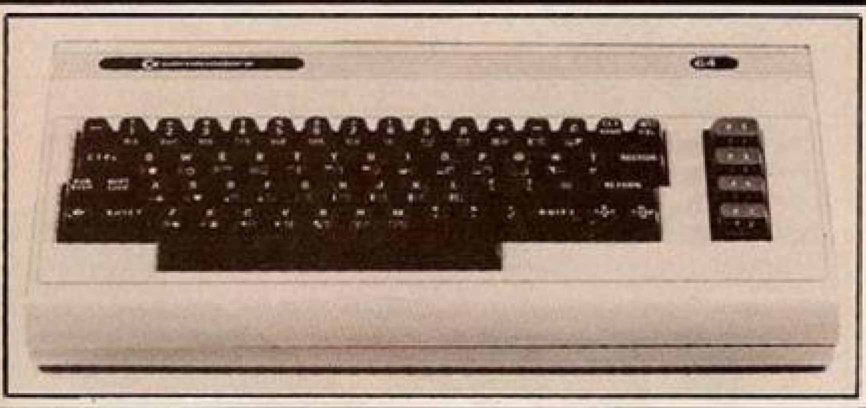
JOIN THE U.K. ATARI COMPUTER OWNERS' CLUB

An independent users' group. Four issues of the club magazine for only £3.00! Address your subscription to Ron. Issue 1 of the club magazine featured a tutorial on character set redefinition and contained a collection of demonstration and games programs and lots more. Issue 2 featured a tutorial on player/missile graphics, an article about graphics on computers, a selection of members' contributions to the program library and much more.

THE FINEST SELECTION OF ATARI SOFTWARE

Teach Yourself Programs		
Conversational French	-5C-16K-YG44X	£39.95
Conversational German	-5C-16K-YG45Y	£39.95
Conversational Spanish	-5C-16K-YG46A	£39.95
Conversational Italian	-5C-16K-YG47B	£39.95
Touch Typing	-2C-16K-YG49D	£19.95
States & Capitals	-1C-16K-YG56L	£14.95
Euro Countries & Capitals	-1C-16K-YG57M	£14.95
•Kids 1 (3 Programs)	-1C-16K-BG00A	£11.75
•Kids 2 (3 Programs)	-1C-16K-BG02C	£11.75
My First Alphabet	-1D-32K-KB23A	£29.95
Learn Programming		
Invitation To Programming 1	-1C-8K-YG43W	£19.95
Invitation To Programming 2	-2C-8K-BQ67X	£22.95
Invitation To Programming 3	-2C-8K-BQ68Y	£22.95
•Basics of Animation	-1C-16K-BQ57M	£14.50
•Player Missile Graphics	-1C-32K-BQ59P	£21.25
•Display Lists	-1C-16K-BQ51F	£14.50
•Horiz/Vertical Scrolling	-1C-16K-BQ53H	£14.50
•Page Flipping	-1C-16K-BQ56K	£14.50
•Sounds & Music	-1C-16K-BG04E	£14.50
•Tricky Tutorials First 6	-3C-32K-BG06G	£69.95
Page 6	-1D-24K-KB24B	£27.50
Business Programs		
Visicalc	-1D-32K-YL39N	£119.95
Atari Word Processor	-1C&3D-48K-YG42V	£99.95
Text Wizard	-1D-32K-BQ99H	£75.00
•Mini Word Processor	-1C-32K-BG08J	£14.50
File-It 2	-1D-48K-BG10L	£33.87
Filemanager 800	-1D-40K-BG59P	£75.00
Graph-It	-2C-16K-YG51F	£14.95
Statistics	-1C-16K-YG52G	£14.95
Mortgage & Loan Analysis	-1C-16K-BQ66W	£14.95
•Bob's Business	-1C-32K-BG11M	£10.59
Adventure Games		
Galactic Empire	-1C-32K-BQ14Q	£14.50
Galactic Trader	-1C-32K-KB25C	£14.50
•Galaxy	-1C-16K-BG75S	£14.95
•Rescue At Rigel	-1C-32K-BQ21X	£20.75
•Datestones of Ryn	-1C-32K-BQ22Y	£13.80
•Star Warrior	-1C-32K-BQ24B	£27.45
•Voyager I	-1C-32K-BQ95D	£14.95
•Invasion Orion	-1C-24K-BQ23A	£17.25
•GFS Sorceress	-1C-48K-KB26D	£21.95
•Planet Miners	-1C-24K-BG89W	£11.95
Star Flight	-1D-40K-BG26D	£14.95
•Journey To The Planets	-1C-32K-KB28F	£20.45
•Crush, Crumble & Chomp	-1C-32K-BQ83E	£20.75
Mission: Asteroid	-1D-40K-BQ91Y	£17.19
Wizard & The Princess	-1D-40K-BQ25C	£21.79
Ulysses & Golden Fleece	-2D-40K-BQ92A	£20.64
Dr Goodcode's Cavern	-1D-48K-KB04E	£21.95
Escape From Vulcan's Isle	-1D-40K-KB30H	£20.75
Zork I	-1D-32K-BQ94C	£29.95
Zork II	-1D-32K-BQ95D	£29.95
Zork III	-1D-32K-KB31J	£29.95
Ali Baba & The 40 Thieves	-1D-32K-BQ78K	£25.93
•Temple Of Apshai (Part 1)	-1C-32K-BQ85G	£27.45
•Upper Reaches (Part 2)	-1C-32K-BQ87U	£13.80
•Curse Of Ra (Part 3)	-1C-32K-BQ89W	£13.80
Dragon's Eye	-1D-40K-KB32K	£20.75
Crypt Of The Undead	-1D-40K-KB33L	£20.75
•Empire Of The Overmind	-1C-40K-BG73Q	£21.95
•King Arthur's Heir	-1C-16K-KB97F	£20.75
•Lords Of Karma	-1C-40K-BG79L	£14.95
Nightmare	-1D-40K-KB35Q	£20.75
Analog Adventure	-1D-32K-BQ33L	£16.95
Adventure Land	-1C-24K-BQ00A	£17.95
Pirate Adventure	-1C-24K-BQ01B	£17.95
Mission Impossible	-1C-24K-BQ02C	£17.95
Voodoo Castle	-1C-24K-BQ03D	£17.95
The Count	-1C-24K-BQ04E	£17.95
Strange Odyssey	-1C-24K-BQ05F	£17.95
Mystery Fun House	-1C-24K-BQ06G	£17.95
Pyramid Of Doom	-1C-24K-BQ07H	£17.95
Ghost Town	-1C-24K-BQ08J	£17.95
Savage Island I	-1C-24K-BQ09K	£17.95
Savage Island II	-1C-24K-BQ10L	£17.95
Golden Voyage	-1C-24K-BQ11M	£17.95
Treasure Quest	-1C-16K-KB36P	£10.95
Softporn Adventure	-1D-40K-BQ93B	£20.64
Deadline	-2D-32K-BQ96E	£37.35
Starcross	-1D-32K-KB37S	£29.95
Energy Czar	-1C-16K-YG53H	£14.95
Kingdom	-1C-8K-YG55K	£14.95
Space Shuttle Module I	-1D-32K-BG65V	£18.95
War Games		
The Shattered Alliance	-1D-48K-BQ98G	£28.95
Legionnaire	-1C-16K-KB00A	£25.95
•The Battle Of Shiloh	-1C-40K-BG63T	£28.95
•Dnieper River Line	-1C-48K-BG71N	£18.95
•Tanktics	-1C-24K-BG93B	£17.45
•Nth Atlantic Convoy Raider	-1C-16K-BG83E	£11.95
•Midway Campaign	-1C-32K-BG81C	£11.95
•Battle For Normandy	-1C-32K-KB38R	£28.95
•Tigers In The Snow	-1C-40K-KB01B	£28.95
War	-1D-32K-KB40T	£17.95
•B1 Nuclear Bomber	-1C-16K-BG68Y	£11.95
•Nukewar	-1C-16K-BG87U	£11.95
•Conflict 2500	-1C-32K-BG85G	£11.95
•Cytron Masters	-1C-32K-KB41U	£28.95
Arcade Games		
Star Raiders	-1E-8K-YG66W	£29.95
•Choplifter	-1E-16K-KB87U	£34.95

Commodore 64
32 computer hardware



THE NEW MAPSOFT CATALOGUE



48 full colour pages of Atari, Dragon and VIC 20 hardware and software. A comprehensive guide to what's available. Price £1.

THE NEW MAPLIN CATALOGUE



contains full details of all the computers and most of the software shown here and much more. On sale now in all branches of W.H. Smith price £1.25. Or send £1.50 to P.O. Box 3, Rayleigh, Essex.

ATARI SOFTWARE continued

Embargo	-1E-8K-KB43W	£34.95
Caverns Of Mars	-1D-16K-BQ69A	£29.95
K-Star Patrol	-1E-8K-BG52G	£34.95
•Protector	-1E-16K-KB88V	£34.95
•Space Chase	-1C-16K-BG42V	£10.95
Gorf	-1E-16K-KB44X	£34.95
Andromeda	-1D-24K-KB17T	£22.50
Bomber Attack	-1C-16K-BG70M	£11.95
Asteroids	-1E-8K-YG60Q	£29.95
•Stellar Shuttle	-1C-16K-KB45Y	£23.50
•Race In Space	-1C-16K-BQ35Q	£14.95
Missile Command	-1E-8K-YG84U	£29.95
Space Invaders	-1E-8K-YG70M	£29.95
Deluxe Invaders	-1E-16K-KB89W	£31.95
K-razy Kritters	-1E-8K-BG51F	£34.95
•Rear Guard	-1C-16K-KB47B	£14.50
•Shootout At OK Galaxy	-1C-16K-BG97F	£14.95
Defender	-1E-16K-KF10L	£29.95
Galaxian	-1E-16K-KF11M	£29.95
•Stratos	-1C-16K-KB53H	£24.95
•Galactic Chase	-1C-16K-BQ62S	£16.95
Threshold	-1D-40K-BG18U	£27.54
•Space Games (3 Programs)	-1C-32K-KB55K	£17.95
•Lunar Lander	-1C-24K-BQ16S	£10.95
•Nautilus	-1C-32K-KB13P	£27.50
Seafox	-1D-48K-KB57M	£23.50
•Sea Dragon	-1C-16K-KB58N	£24.95
K-razy Shoot Out	-1E-8K-BQ63T	£34.95
•Shamus	-1E-16K-KB90X	£34.95
Serpentine	-1E-8K-KB60Q	£34.95
Centipede	-1E-16K-BQ70M	£29.95
Angle Worms	-1C-8K-BG50E	£10.95
•Bug Off!	-1C-16K-KB61R	£21.95
•Bug Attack	-1C-24K-BG36P	£23.95
•Tutti Frutti	-1C-16K-KB63T	£17.95
•Genetic Drift	-1C-16K-KB65V	£23.50
•Haunted Hill	-1C-16K-BG38R	£16.95
Claim Jumper	-1E-16K-KB67X	£34.95
•Chicken	-1E-16K-KB91Y	£34.95
•Canyon Climber	-1C-16K-BG44X	£23.50
•Frogger	-1C-16K-KB68Y	£22.95
•Preppie	-1C-16K-KB07H	£21.95
•Pacific Coast Highway	-1C-16K-BG13P	£23.50
Fire Bird	-1E-4K-KB70M	£29.95
•Apple Panic	-1C-16K-KB92A	£23.50
Track Attack	-1D-32K-KB05F	£23.50
Pac-Man	-1E-8K-BQ71N	£29.95
Ghost Hunter	-1C-16K-BQ64U	£19.95
•Jawbreaker	-1C-16K-BG17T	£20.64
Mouskattack	-1D-32K-BQ77J	£22.95
K-razy Antiks	-1E-8K-KB16S	£34.95
Pathfinder	-1D-32K-BG33L	£26.66
•Labyrinth	-1C-16K-KB71N	£23.50
•Crossfire	-1E-16K-KB93B	£34.45
Tumble Bugs	-1D-24K-BG46A	£23.50
Wizard Of Wor	-1E-16K-KB94C	£34.95
•Time Bomb	-1C-16K-BG40T	£10.95
Thunder Island	-1C-16K-BQ37S	£10.95
TT Racer	-1C-16K-KB73Q	£19.95
•Dodge Racer	-1C-16K-BG29G	£27.50
•Matchracer	-1C-16K-BG31J	£22.50
•Baja Buggies	-1C-16K-KB74R	£22.95
•Zaxxon	-1C-16K-KF20W	£31.50
•Moon Shuttle	-1C-16K-KF22Y	£27.50
Roadracer/Bowler	-1C-16K-BG99H	£11.95
•Shooting Gallery	-1C-16K-BQ36P	£14.95
•Shooting Arcade	-1C-16K-BG15R	£23.50
Rasterblaster	-1D-32K-BG35Q	£22.95
David's Midnight Magic	-1D-48K-KB78K	£27.50
Super Breakout	-1E-8K-YG67X	£24.95
•Clowns & Balloons	-1C-16K-KB79L	£23.50
Guns Of Fort Defiance	-1C-32K-BG78K	£14.95
Mountain Shoot	-1C-16K-BQ12N	£10.95
•Tank Trap	-1C-16K-YL34M	£9.95

Home Entertainment

Scram	-1C-16K-YG58N	£19.95
Knockout	-1C -16K-KB81C	£14.95
Basketball	-1E-8K-YG61R	£24.95
Cypher Bowl	-1C-16K-BQ20W	£29.50
Sunday Golf	-1C-16K-BQ13P	£10.95
Golf Challenge	-1C-16K-KB82D	£17.19
Tournament & 8-Ball Pool	-1C-16K-BQ45Y	£19.95
•Ricochet	-1C-16K-BG47B	£13.80
Computer Chess	-1E-8K-YG63T	£24.95
Fast Gammon	-1C-8K-YL33L	£16.95

•Gomoku	-1C-16K-BQ18U	£14.95
•Reversi	-1C-16K-BQ19V	£14.95
•Acquire	-1C-16K-BG66W	£14.95
•Stocks & Bonds	-1C-32K-BG91Y	£14.95
Cribbage & Dominoes	-1C-16K-BQ43W	£14.95
•Poker Solitaire	-1C-16K-BQ17T	£10.95
Blackjack	-1C-8K-YG62S	£14.95
Hangman	-1C-8K-YG54J	£14.95
Wordrace	-1D-32K-KB09K	£19.65
Wordrace (Part 2)	-1D-32K-KB10L	£15.66
Abuse	-1D-40K-KB11M	£19.65
Super Cubes & Tilt	-1C-16K-BQ48C	£14.95
Humpty Dumpty Jack & Jill	-1C-16K-BQ38R	£14.95
Hickory Dickory & Baa Baa	-1C-16K-BQ39N	£14.95
European Scene Jigsaws	-2C-16K-BQ41U	£14.95
Video Easel	-1E-8K-BQ72P	£24.95
Micro Painter	-1D-48K-BG56L	£27.50
Paint	-1D-48K-KB22Y	£29.95
Music Composer	-1E-8K-YG48C	£35.95
Movie Themes	-1C-8K-BQ34M	£9.95

Computer Languages

Assembler	-1C-16K-YL32K	£21.95
Syn Assembler	-1D-48K-KB83E	£38.95
Assembler Editor	-1E-8K-YG68Y	£34.50
Macro Assembler	-1D-32K-BQ73Q	£59.95
Basic A+ & Op System A+	-1D-48K-BQ32K	£59.95
Microsoft Basic	-1D-32K-BQ74R	£59.95
Pilot (Educator)	-1E & 2C-16K-BQ75S	£79.95
Pilot (Consumer)	-1E-8K-YG69A	£54.00
QS Forth	-1D-24K-YL29G	£62.95
Tiny-C	-1D-48K-BG62S	£67.80
Inter-Lisp/65	-1D-48K-BG61R	£99.00

Utilities

SAM (Speech Synthesiser)	-1D-32K-KB15R	£47.19
Programming Aids Pack	-1C-16K-BG60Q	£10.95
•Basic Routines	-1C-16K-KB84F	£24.95
•6502 Disassembler	-1C-8K-YL30H	£9.95
Atari World	-1D-40K-BQ27E	£47.95
•3D-Supergraphics	-1C-40K-BQ29G	£31.95
The Next Step	-1D-32K-BG64U	£27.54
K-DOS	-1D-32K-BQ76H	£59.95
Diskey	-1D-32K-KB86T	£39.95
Disk Manager	-1D-32K-BG58N	£27.50
Disk Detective	-1D-16K-BG57M	£23.50
MAC65 & Op System A+	-1D-32K-BQ30H	£59.95
Telelink	-1E-8K-YG59P	£21.95

•*Disk versions also available though price and memory size may be different.*

Books

Master Memory Map	-XH57M	£4.00
De Re Atari	-WG56L	£16.95
Operating System User's Manual & Hardware Manual	-WA46A	£16.95
Atari Basic-Learning By Using	-WG55K	£6.24
Games For The Atari	-WA47B	£4.45
Atari Basic	-WG05F	£7.65
Atari Sound & Graphics	-WA39N	£8.25
Your Atari Computer	-WA40T	£13.45
6502 Assembly Language Subroutines	-WA05F	£14.90
Advanced 6502 Interfacing	-WA41U	£11.64
Beyond Games (6502)	-WA45Y	£13.00
Computers For People	-WA00A	£8.25
Analog: The Magazine For Atari (6 issues) Annual Subscription	-GG24B	£9.00

Send sae now for our new software leaflet with details of all the above programs. Order As XH52G — Issue 3.

Key: C = Cassette. D = Disk. E = Cartridge. 2C = 2 Cassettes etc. 8K, 16K shows minimum memory requirement.

Note: Order codes shown in brackets. Prices correct at time of going to press. (Errors excluded).

VIC20 COLOUR COMPUTER

Hardware

VIC20 Console	(AF47B)	£159.99
C2N Cassette Unit	(AF48C)	£44.95
VIC Printer	(AF49D)	£230.00
VIC Disk Drive	(AF50E)	£299.99
3K RAM Cartridge	(AF51F)	£29.95
8K RAM Cartridge	(AF52G)	£44.95
16k RAM Cartridge	(AF53H)	£59.95

Joysticks and Paddles

Single Joystick	(AC53H)	£7.50
Pair of Joysticks	(AC37S)	£13.96
Le Stick	(AC45Y)	£24.95
Pair of Paddles	(AC30H)	£13.95

Programming Aid Cartridges

Super Expander: 3K RAM and Hi-res graphics	(AC54J)	£34.95
Programming Aid: Additional commands, function Key programming etc	(AC55K)	£34.95
Machine Code Monitor	(AC56L)	£34.95

Software (all 3K unless stated)

Introduction to BASIC Cassettes

Part 1	(AC57M)	£14.95
Part 2	(AC58N)	£14.95

Game Programs

Avenger Cartridge	(AC59P)	£19.95
Star Battle Cartridge	(AC60Q)	£19.95
Super Slot Cartridge	(AC61R)	£19.95
Jelly Monsters Cartridge	(AC62S)	£19.95
Alien Cartridge	(AC63T)	£19.95
Super Lander Cartridge	(AC64U)	£19.95
Road Race Cartridge	(AC65V)	£19.95
Rat Race Cartridge	(AC66W)	£19.95
Blitz Cassette	(AC67X)	£4.99
Mole Attack Cartridge	(AC85G)	£24.95
Adventureland Cartridge	(AC86T)	£24.95
Pirate Cove Cartridge	(AC84F)	£24.95
Mission Impossible Cartridge	(AC87U)	£24.95
Voodoo Castle Cartridge	(AC88V)	£24.95
The Count Cartridge	(AC89W)	£24.95
Sargon 2 Chess Cartridge	(AC77J)	£24.95
Gorf Cartridge	(AC90X)	£24.95
Omega Race Cartridge	(AC91Y)	£24.95
Another VIC in The Wall Cassette	(AC78K)	£7.00
VIC Panic Cassette	(AC79L)	£7.00
Cosmiads Cassette	(AC80B)	£7.00
Backgammon Cassette (+3K)	(AC81C)	£7.00
VIC-Men Cassette	(AC82D)	£7.00
VIC Asteroids Cassette	(AC83E)	£7.00

Business Programs

Simplicalc Disk (+16K)	(AC92A)	£24.95
Simplicalc Cassette (+16K)	(AC93B)	£19.95
VIC Stock Control Cassette (+8K)	(AC94C)	£19.95
VIC File Disk (+16K)	(AC95D)	£24.95
VIC Writer Disk (+8K)	(AC96E)	£24.95
VIC Writer Cassette (+8K)	(AC97F)	£19.95

Education (CSE & GCE 'O' Level Revision)

All cassette based and require at least 8K expansion memory

English Language	(AC98G)	£9.99
Mathematics 1	(AC99H)	£9.99
Mathematics 2	(BC00A)	£9.99
Biology	(BC01B)	£9.99
Chemistry	(BC02C)	£9.99
Physics	(BC03D)	£9.99
Computer Studies	(BC04E)	£9.99
Geography	(BC05F)	£9.99
History	(BC06G)	£9.99
Arithmetic for 9 to 11 year olds	(BC07H)	£9.99
Reading for 9 to 11 year olds	(BC08J)	£9.99
General Knowledge for 9 to 11 year olds	(BC09K)	£9.99
Spelling for 9 to 11 year olds	(BC10L)	£9.99

Home Programs

All cassette based and require at least 8K expansion memory

Quizmaster	(BC11M)	£9.99
Know Your Own IQ	(BC12N)	£9.99
Junior IQ	(BC13P)	£9.99
Know Your Own Personality	(BC14Q)	£9.99
The Robert Carrier Family Menu Planner	(BC15R)	£9.99
VIC Money Manager	(BC16S)	£9.99
VIC Road User & Highway Code	(BC17T)	£9.99
Garden Planner	(BC18U)	£9.99
Interior Designer	(BC19V)	£9.99
BBC "Ask The Family"	(BC20W)	£9.99
BBC "Mastermind"	(BC21X)	£9.99
"Mastermind" additional General Knowledge:		
Data 1	(BC22Y)	£2.50
Data 2	(BC23A)	£2.50
Data 3	(BC24B)	£2.50
Data 4	(BC25C)	£2.50
"Mastermind" additional Specialist Knowledge:		
Wine & Food	(BC26D)	£2.50
Music	(BC27E)	£2.50
Sport & Games	(BC28F)	£2.50
Films & TV	(BC29G)	£2.50

Books About VIC

Learn Programming on the VIC	(WA31J)	£2.50
VIC Revealed	(WA32K)	£10.00
VIC Programmers Reference Guide	(WA33L)	£9.95
VIC Graphics	(WA48C)	£10.00

Lots of new VIC20 software now available.

MAPLIN

Maplin Electronic Supplies Ltd., P.O. Box 3, Rayleigh, Essex. Tel: Southend (0702) 552911/554155.

**Demonstrations at our shops NOW. See the computers in action at 159-161 King St., Hammersmith W6. Tel: 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel: (0702) 554000
Lynton Square, Perry Barr, Birmingham: Tel: (021) 356 7292.**

dk'tronics

ZX KEYBOARD FOR USE WITH 80/81 SPECTRUM

Our new cased keyboard has 52 keys, 12 of these are used for the numeric pad. The numeric pad offers some useful features, you can cursor with one hand and it will be a boon for anyone who enters a lot of numeric data. The pad is a repeat of the 1-9 keys plus it has a full stop and a shift key. The numeric pad keys are coloured in red, the normal keyboard keys are grey, with the case being black which makes the whole thing very attractive. The case measures 15 × 9 × 2½. The computer (either 80/81 or spectrum) fits neatly inside. You will have to remove the computer from its original case, it is then screwed to the base of the case. The case had all the bosses already fitted and the screw holes are marked. Also fitted inside the case is a mother board (81 model only) which allows 16K, 32K and 64K to be fitted in the case. All the connections are at the rear of the case i.e. Power, Mic, Ear, T.V. and the expansion port. The case is large enough for other add ons also to be fitted inside. One of these could be the power supply, then you could very quickly fit a mains switch, or a switch on the 9V line. This means you have a very smart self-contained unit. This case does not stop you from using any other add-ons that you may have e.g. Printer etc. We are convinced that this is the best keyboard available at present. It offers more keys and features than any other keyboard in its price range.

£45



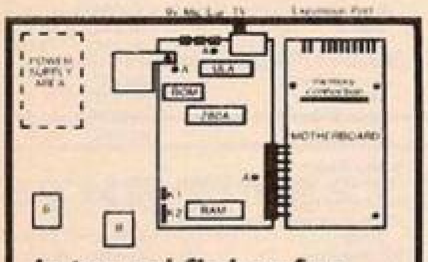
NOTE

The case can be purchased separately with the keyboard aperture uncut, so if you have one of our early uncased keyboards, or in fact any other suppliers' keyboards, these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute job and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX 81 or Spectrum case.

SPECTRUM MODEL

This is supplied with spectrum legends, and a slightly different base for fitting the spectrum inside, again all the connectors are at the rear of the case and there is plenty of room for the power supply (and other add-ons). Should you want to change, we can supply both the Spectrum legends and details of updating your case which will enable modification from the ZX 81 to spectrum. PLEASE specify on your order whether you require the ZX 81 or spectrum case.

KEYBOARD (SPECTRUM/81)



Internal fixing for ZX 81 keyboard case.



Internal fixing for spectrum keyboard case.

SPECTRUM LIGHT PEN

The pen enables you to produce high resolution drawings on your own television set, saving a vast amount of time over using basic programming statements, such as Plot, Draw etc. You can erase, modify and save drawings and it comes complete with software program. The superb light pen is available from D.K. tronics.



£19.95

SPECT

16K Memory
The 16K uses
Static Ram an
using the Stat
speed low po
the computer
which comes
where. Positic

64K Memory
All the above
advantage lie
56K of usable
the use of oth
8192-65536. T

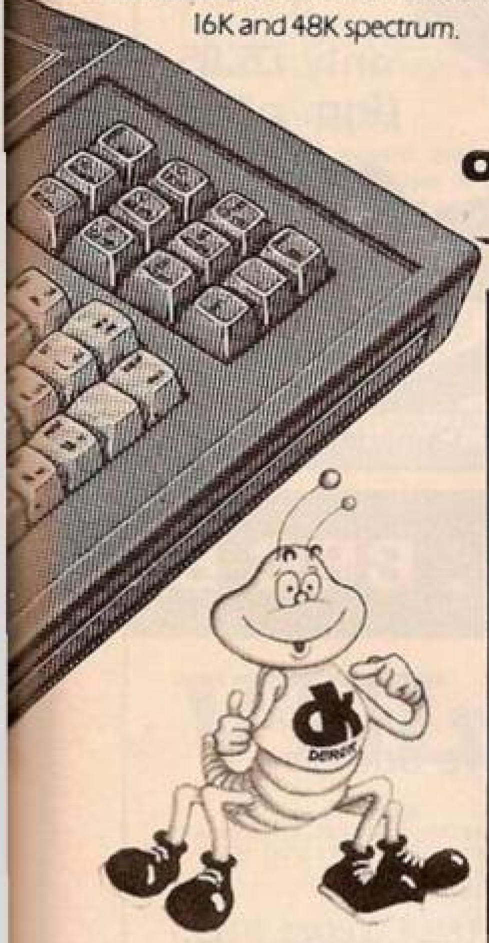
Spectrum M
Upgrade your
it is simply slip
are supplied, a
time. The fittir
same as Sincla

ZX 80~81 Spectrum HARDWARE

SPECTRUM/81 TOOLKIT

This is the toolkit which won acclaim in the feature in the August 1982 issue (pages 29 and 30) of Sinclair User. "It is the most impressive program, fast in execution with clear and full instructions...it stands out from the rest of the field." The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K spectrum.

Both at only £6.95



4K GRAPHICS ROM £24.95

The DK Graphic module is our latest ZX 81 accessory. This module unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

WHY WAIT?
ORDER TODAY FOR FAST DELIVERY

FLEXIBLE RIBBON CONNECTOR

If you have ever had whiteouts or system crashes this could be the answer. It stops the movement between the computer and the RAM expansion, it is supplied with a ribbon, 6 inches long, with a male connector at one end and a female at the other, at only

£10



16/64 MEMORY FOR ZX 81



16K Memory £22.95
16K (uncased) £19.95
64K Memory £52.95
64K (uncased) £49.95

The above illustration shows the casing for the 16K or massive 64K.

UM MEMORY

nsion £22.95

namic Ram Chips. We use the dynamic as they are much denser than y less space. They are also much cheaper than the equivalent product The Ram is manufactured with high quality materials, and uses high ms. It is supplied ready-built and only needs to be plugged into the rear of e components are fitted into holders. This massive add-on memory fully assembled and tested is the cheapest 16K memory available any-emory from 16384 to 32768. (Same as the Sinclair memory.)

16K (UNCASED) £19.95

nsion £52.95

ation on the 16K also applies to the 64K Memory Expansion, but the 64K giving nearly FOUR times the memory. This advanced model has y. In addition, the block from 8K to 16K can be switched out to enable ons. The graphics ROM is to be used in this area. Position in Memory: k From 8192-16384 is switchable.

64K (UNCASED) £49.95

Expansion £35.00

m to 48K of user Ram. The Spectrum memory expansion is simple to fit, de the case, and then only requires plugging in. Full fitting instructions only tool you will need is a screwdriver and just two minutes of your es no electronic skills. Position in memory from 32768 to 65536. (The rade to 48K).

Please state type of machine, which Rom memory size, quantity and place when ordering.

Please send me . . . . @ £ . . . .
Please send me . . . . @ £ . . . .
Please send me . . . . @ £ . . . .
Please add on £1.25 for P/P
In enclose cheque/P.O. payable to DK Tronics total £ . . . .
or debit my Access/Barclaycard

Signature . . . .
Name . . . .
Address . . . .

Send to DK Tronics, 23 Sussex Road, Gorleston, Gt. Yarmouth, Norfolk.
Tel: Gt. Yarmouth (0493) 602453

dk'tronics

New colour brochure now available, send SAE for quick return

C.J.E. Microcomputers

BBC

VAT included where applicable

QUALITY DISK DRIVES

Single drive 40 track single sided 1 × 100k £200.00
Dual drive 40 track single sided 2 × 100k £350.00
Dual drive 40 track double sided 2 × 200k £546.25
Dual drive 80 track double sided 2 × 400k £799.25

All drives are cased with own PSU for reliability, and include connecting cables and utilities disk. Delivery £4.00.

SOFTWARE FOR THE BBC MICRO

MISSILE CONTROL the first implementation on the BBC Micro of the popular arcade game. (32K) £9.00
MAZE MAN an authentic version of the popular arcade game. (32K) £6.00
BALLOONS a highly original game that soon becomes compulsive playing. (32K) £6.00
DISSASSEMBLER the memory dump routine includes a scrolling back in memory facility. (16K) £5.00

MISSILE CONTROL, MAZE MAN & BALLOONS use the Keyboard or Joysticks for control

30+ PROGRAMS FOR THE BBC MICROCOMPUTER

This Book contains program listings, with explanations & tips on using the BBC Micro
GAMES UTILITIES GRAPHICS & MUSIC
Most programs will run on Model's A & B
Edited by C.J. Evans, various Authors.
A pair of cassettes with all the programs is available.

BOOK £5.00
BOK & CASSETTE SET £9.00

LEADS

The BBC Micro comes without a cassette lead
7Pin Din to 2 × 3.5mm & 1 × 2.5mm minijacks £4.00
7Pin Din to 5Pin Din & 2.5mm minijack £4.00
7Pin Din to 7Pin Din £4.00
7Pin Din PLUGS .... Two for £0.65
6Pin Din PLUGS (for RGB socket) .... Two for £0.65
5Pin Din PLUGS (360° for RS232) .... Two for £0.65

RS423 TO RS423 (BBC Micro to BBC Micro)
Two metre cable £4.00 Four metre cable £5.00

TELEVISION/MONITOR LEADS
full range available

Phono plug to Co-ax with high quality cable 3 Metres £3.00
BNC Plug to BNC Plug £3.10
BNC Plug to Phono Plug (i.e. BBC Micro to Rediffusion TVRM) £2.20

PRINTER CABLES

BBC to 36 way Centronics Type connector £17.50
BBC to 25 way D Type (For use with RS232) £9.50
BBC to 40 way edge connector (Centronics 739) £20.00
TORCH to 36 way Centronics Type connector £20.00

BLANK C30 COMPUTER CASSETTES

Ten for £4.50

15 Way D Type Plug with Cover £2.75
Computer graphics design pads 100 sheets £4.00

BBC UPGRADE KITS

RAM UPGRADE (100ns) £23.00
KIT A Printer & I/O Port £9.50
KIT B Analogue Port £8.00
KIT C Serial I/O & RGB £10.00
KIT D Expansion Bus/Tube £7.50
Full Upgrade kit £58.00

All components full specification

STAR DP8480 PRINTER FROM £250.00 INC VAT

80 CPS : 80/96/132 COLS
BIDIRECTINAL LOGIC SEEKING
TRACTOR WITH FRICTION FEED
CENTRONICS .... £217.39 + £32.61 VAT = £250.00
RS232 .... £235.00 + £35.25 VAT = £270.25
High Res Graphics option to allow BBC Screen dumps £15.00/£20.00
(24HR SECURICOR DELIVERY FOR PRINTERS £8.00)

VAT included where applicable

Send SAE for full Price List of our large range of accessories.
POSTAGE Add 50p per order or as stated

C.J.E. Microcomputers Dept (YC), 25 HENRY AVE, RUSTINGTON, W. SUSSEX BN16 2PA (09062) 6647

Battle of Britain

By Microgame Simulations for the Spectrum

One day in summer, 1940. Reports are coming in of enemy bomber squadrons crossing the English coast; target unknown.

How are you to deploy the nine fighter squadrons under your command to intercept the incoming threat!

British and enemy squadron movements are plotted on a superb high resolution secreen map of south east England with communications signals presented both visually and in morse code.

Features variable difficulty levels, full control of squadron movements, randomly selected targets and bomber routes for each game, intelligence reports, refuelling etc.

A tense game of strategy for one player.



73 The Broadway, Grantchester, Cambridge CB3 9NQ

DRAGON ... BBC B

If *Your Computer* says it's good . . . what more can we add?

DEATH'S HEAD HOLE — a unique adventure for the Dragon and BBC B, written with the advice of cave rescue experts — you'll almost believe it's true! Hours of enjoyment and excitement.
Dragon/BBC B £5.45

LIONHEART — our terrific new two-part graphics adventure for the Dragon, inspired by Richard the Lionheart's Third Crusade to the Holy Land. Masses of features.
Dragon only £5.45

CHAMPIONS! — Fancy your chances as the next Brian Clough? This is the most complete, realistic and engrossing management game you'll find. If you don't give two hoots about football, you'll be hooked — if you do, you'll be playing all night! Buy and sell players, keep the bank happy, cope with players' suspensions and the club's problems, then get your strongest team ready as each Saturday approaches. Features weekly updates of league table, promotion and relegation, allows checks on opponents' teams, transfer market, and much, much more. This is the game that we play!
Dragon/BBC B £5.45

WORDS AND PICTURES
7 HAWTHORN CRESCENT, BURTON-ON-TRENT

EASY ORDER: Clip the coupon, or simply note your name, address, computer and programs required on the back of your cheque.

Yes . . . please send BY RETURN OF POST for the

☐ Dragon 32 ☐ BBC B

☐ Death's Head Hole ☐ Lionheart ☐ Champions!

Name ....

Address ....

....

ALL POSTAL CUSTOMERS RECEIVE PERSONAL PREVIEW OFFERS ON NEW PROGRAMS

ATTENTION ALL DRAGON OWNERS!

FED YOUR DRAGON LATELY?

THEN TEMPT HIS TASTEBUDS WITH THE MEATIER MORSELS FROM **Active Software!**
OUR POLICY IS **100%** CUSTOMER SATISFACTION — **TRY US!**



8 CHALLENGING GAMES ON ONE CASSETTE — EACH GAME INCORPORATING THE SPECTACULAR FEATURES OF THE **DRAGON 32**:—
•BRILLIANT COLOUR• •IMPRESSIVE HI-RES GRAPHICS• •EXCITING SOUND EFFECTS•

1) Interplanetary Trader — 20k+!
The year 2283. Occupation:- Space Trader. Tour the Solar System in this real time game. Very challenging and feature packed.

2) Execution —20k+!
A hangman style game with a difference. Play the computer or an opponent. Lots of extra features. Good graphics and sound.

3) Wumpus Mansion — 20k+!
Incredible Fun!! Outwit the Wumpus (if you can....) and raid the treasures of the Mansion. But don't trigger the — TIME BOMB! —

4) Wipeout
Compulsive, exciting, challenging game of fast reaction. Begins easy but gets progressively harder. With sound and graphics.

5) Hi-Lo — 20k+!
Is it skill or is it luck?? Turn £50 into £1,000,000 with this simple, yet highly entertaining game. Super sound. Brilliant colour, and graphics.

6) Snail Pace
Announcing: - SNAIL DERBY-! Super entertainment! Computer calculated odds and form. 2 - 8 snails per race. Beat the bookie! Full Graphics.

7) Atom Hunt
Full colour, sound, and graphics add to the excitement of this addictive game of deduction. Features:- 1 to 4 players: individual scores and ratings.

8) Air Assault
Blast the skyscrapers with ultra-high explosive bombs and clear a space to land your crippled aircraft before crashing. Hi-res graphics and sound.

48 Hour Dispatch

* All 8 programs supplied for the realistic price of just: — **£5·75** + 25p P & P
* All 8 programs double recorded on our own quality tape.
* No-quibble replacement guarantee. * 48 hour dispatch.

Send Chq/P.O. to: Active Software, Temple House, 43-48 New St., Birmingham B2 4LH.

SPECTRUM 48K SPECTRUM 48K

VELNOR'S LAIR

THE MOST REALISTIC ADVENTURE YET

The Black Wizard Velnor has gone into hiding in the Goblin Labyrinth of Mt. Elk. The reason is now plainly clear, after centuries of searching he has finally discovered the ancient tomb of Grako and is now about to realise his ghastly ambition to become a true demon on earth! Time is too short to mass an Army aganist Velnor. There is only one hope for mankind. That one brave adventurer may be able to penetrate Velnor's defences, defeating his guards, avioding the traps and surprising Velnor before the metamorphosis is complete. You are that chosen person, but beware, not only does Velnor employ the most ghastly of creatures as guards, he is also a master of illusion.

In this D & D stye adventure you may be a Wizard, Warrior, or Priest, as a Warrior you are best suited to battle, but how will you cope with the fiendish spells of Velnor? As a Wizard your spells are devastating, but beware, your magic is limited and armed combat doesn't come easy! As a Priest you may protect yourself with the devine powers and you have no fear of the undead, but how will you handle the ghastly Trolls?

The adventure will require ingenuity and careful planning. Combat takes the form of D & D style scenarids where instant death is rare but, beware, wounds are cumulative and stratergy is of the utmost importance.

Only £6·50 inc. p+p

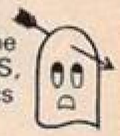
Cheques or P. O. to:

NEPTUNE COMPUTING (Dept. YC1)
98, Howe Street,
Gateshead, Tyne & Wear NE8 3PP

VECTIS SOFTWARE

VECTIS SOFTWARE
6 Victoria Rd,
Sandown,
Isle of Wight
PO36 8AP

VIC 20 16K and 48K . . . FAST ACTION MACHINE CODE.

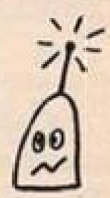


PONY EXPRESS (frogger-type game). Can you cross the desert and the river avoiding INDIANS, WAGON TRAINS, CANOES and CROCODILES? Full colour, superb graphics and sound effects. Multiple skill levels make this a very addictive game. £4.95

VEC-MAN Superb all colour machine code version of this popular game. £4.95



ZX Spectrum FAST ACTION by KEN TINDELL IBM Cup Winner for 3.5K machines.



DEATH MAZE OF MANDRAGON difficult and addictive, not for the faint hearted. £4.95

FURTHER MAZE MODULES for the above. £4.95

ASTRO DODGER and **SNAKE** can you avoid trouble whilst surveying Magron IV? How many numbers can your snake swallow? 2 addictive games. £4.95



EDUCATIONAL TAPES for **ZX SPECTRUM** and **VIC-20** . . . 3K, 8K and 16K.

CHEMISTRY TEST helps to revise 'O' level chemistry. Please state which computer when ordering. £3.95.

IMMEDIATE DESPATCH
All pirces include post and packing.
Quality products from VECTIS SOFTWARE

HAVE YOU GOT A BBC MICRO? THEN YOU NEED:

LASERBUG

WE WON'T TRY TO PUSH LASERBUG ON YOU LIKE THE OTHERS – SEND OFF FOR A SAMPLE COPY AND YOU'LL FIND THAT LASERBUG SELLS ITSELF

ILABLE . . . BBC DUST COVERS AVAILABLE . . . BBC DUST COVERS AVAILABLE . . . BBC DUST COV

Specially made LASERBUG Dust Covers available for only £3.25 inclusive. Made of high quality polyester/cotton which is better than the less attractive PVC ones. Anti-static and in a complimentary colour. Use the form at the bottom to order.

ERS AVAILABLE . . . BBC DUST COVERS AVAILABLE . . . BBC DUST COVERS AVAILABLE . . . BBC

Please supply me with: A sample copy of LASERBUG @ £1.00
A 12 Month subscription to LASERBUG @ £12.00 for 12 issues of the magazine
A 6 Month subscription to LASERBUG @ £6.00 for 6 issues of the magazine
An overseas subscription to LASERBUG @ £14.00 (Surface Mail – write for details of air mail)
. . . . . . LASERBUG Dust Cover(s) @ £3.25 each

I enclose a cheque/PO for £ . . . . made payable to LASERBUG

NAME . . . . ADDRESS . . . .

. . . .

Please send the completed form to: LASERBUG Dept. YC, 10 Dawley Ride, Colnbrook, Slough, Berks., SL3 0QH.

COMPUSENSE LTD

Computer Systems Consultants

286D Green Lanes, PO Box 169
Palmers Green, London N13 5XA
Telephone: 01-882 0681/6936

DRAGON and TANDY COLOR software

1. **DEMON Machine Code Monitor** COLOR/DRAGON cartridge £18.95
A complete system for entering machine code programs, as reviewed in Popular Computing Weekly Vo. 2 No. 4 — "Easy to use . . . a useful tool . . . reasonably priced". Now for Tandy Color owners as well!

2. **DECODE Machine Code** COLOR/DRAGON cartridge £18.40
This cartridge could save you a small fortune! DECODE converts TANDY COLOR BASIC programs to DRAGON BASIC and vice versa. Just load a TANDY tape on your DRAGON, or a DRAGON type on your TANDY COLOR, and run DECODE to convert the program into the other BASIC! (Prove it works — convert it back again!) Now all you COLOR computer owners can take advantage of all that lovely DRAGON software! introductory price.

3. **DASH Machine Code** DRAGON cartridge £18.95
A true 6809 assembler for the DRAGON Computer. Assembly statements are entered in BASIC mode and can be intermixed with BASIC statements. Use BASIC for load and save and for editing source — simple and no time waste learning new commands. A sophisticated product for a demanding task.

4. **SPACE RACE Machine Code** COLOR/DRAGON cartridge £18.95 cassette £7.95
Action packed arcade game. Chase around the track destroying hordes of aliens — watch out for the mines! Uses keyboard or Joysticks. 15 skills levels, high resolution graphics, sound. Addictive!

5. **C-TREK BASIC** COLOR/DRAGON cassette £7.95
Super space adventure game, graphics and sound, destroy the Klingons before they get you. Real time operation (no time for tea!).

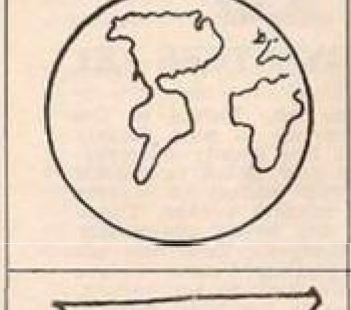
6. **DESERT GOLD BASIC** COLOR/DRAGON cassette £7.95
High resolution display and good sound effects.

7. **POKER BASIC** COLOR/DRAGON cassette £7.95
Fast action, excellent graphics and sound, machine code assisted for speed!

8. **PIRATES AHOY BASIC** COLOR/DRAGON cassette £7.95
An adventure game. Solve the puzzles to find all the treasure — absorbing.

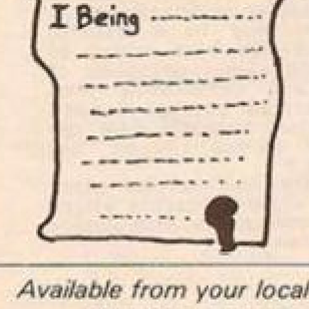
BOOKS
Leventhal — 6809 Assembly Programming £12.10 p&p 0.50p

Authorised Distributors for Spectral Inc. USA, TSC Inc. USA, CSC Inc. USA
Introductory offer — any three BASIC games for £19.95
Order by ACCESS/VISA or cheque by telephone or post.
24 hr answerphone service



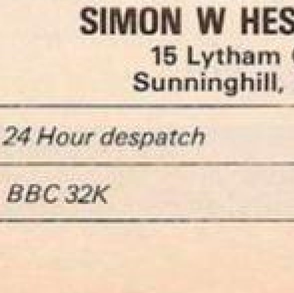
1. GREAT BRITAIN LIMITED
You are PM and Chancellor. Fight INFLATION and UNEMPLOYMENT, balance the BUDGET and try to stay POPULAR.

ACORN USER: "Highly enjoyable".
ZX COMPUTING: "A challenging game".
MICRO UPDATE: "A dream for megalomaniacs".
£5.95 on cassette.
A MUST FOR ELECTION YEAR



2. INHERITANCE
A 2 part game packed full of features. Try to gain your INHERITANCE in part 1 and if successful takeover the PARADISE COLA Co. in part 2.

PERSONAL COMPUTER WORLD: "Well presented and good value for money".
£5.95 on cassette.



3. THE WORLD TRAVEL GAME
A game for 1 or 2 players. Your aim is to collect 6 souvenirs from around the world (from Russia to Falklands) in the shortest possible time.
Cope with HIJACKS, STRIKES, THIEVES, CASH SHORTAGES, BANKRUPTICES, BAD WEATHER ETC.
. . World Map & full instructions supplied.
BBC ONLY: **£6.95** on cassette.

Available from your local computer shop or direct from:

SIMON W HESSEL SOFTWARE, (Dep. YC4)
15 Lytham Court, Cardwell Crescent,
Sunninghill, Berkshire. Tel: Ascot 25179

24 Hour despatch *1 Year guarantee*

BBC 32K *SPECTRUM 48K*



MicroBase. Fits your computer into your home. With style.

MicroBase. Crafted in solid mahogany, hand polished and superb quality. Complete with fitted nylon dustcover to suit TV's with up to 14" screens. MicroBase suits most computers - Sinclair, BBC, Atom, VIC, Oric, Dragon, Lynx, etc., plus room for accessories. Price £20, postage £2, VAT included.

To Order...
please send your payment to:
Peter Furlong Products, Unit 5 y, South Coast Road Ind. Estate, Peacehaven, E.Sussex BN9 8NA.
Tel. (07914) 81637. ACCESS, VISA.
Please state make of computer.

Dealers...
MicroBase will enhance your displays and your profits. Check out our special offer.
Custom display units supplied.

GEMINI SOFTWARE

ZX81 (16K) SPECTRUM (48K)
STARTREK

Features an 8 × 8 Galaxy, Klingons and Starbases, short and long range scans, Torpedoes and Phasers, Computer etc.
PLUS Normal or Hyperdrive: choose your speed but watch the energy level.
Galaxy Map: keep track of where you have been. Also, shows whether any Klingons remain there, and where the starbases are.
Visual display of Enterprise's position and movement.
Visual display of photon torpedo.
Messages from crew members.
5 levels of play. And much more.

Cassette plus full instructions.

ZX81 £4.95
Spectrum £5.95 (colour and sound too)
Sae for other programs.

Gemini Software
36 BADMINTON RD, LEICESTER LE4 7RQ.
TEL: (0533) 64915

THE NEW SPECTRUM
'ADD-ON'
NOW WITH ADDITIONAL SWITCH-TYPE JOYSTICK PORT
BLADAMM!
ONLY £22·50 PLUS VAT

COMPLETE your SPECTRUM with our Multi-purpose Sound Generator and Joystick-port Board!! With one low-cost purchase you can obtain the following outstanding improvements to your ZX SPECTRUM:

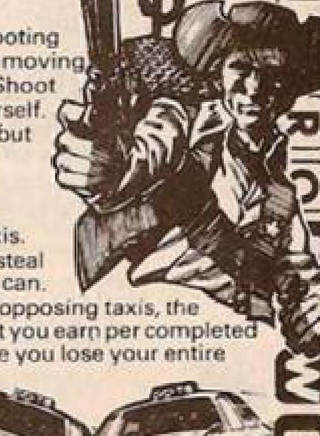
- THREE CHANNEL sound effects. PROGRAM three independent sounds with music, gun shots, explosions etc.
- AMPLIFICATION of the standard sound output.
- TWO ports for Potentiometer Joysticks;
- ONE port for Switch-type Joystick.

The 'ADD-ON' uses the amazing AY-3-8910 SOUND Chip, which gives you an enormous range of sound effects. The output and volume of each channel can be separately controlled, with gun shots, explosions, drums etc., produced under the 'sound envelope'. MOST IMPORTANT TO NOTE — the CHIP is 'processor independent.' This means that sounds can continue to be produced without any noticeable effect on the speed of your program!!
The 'ADD-ON' contains its own speaker and amplifier chip and is supplied with a cassette containing sound demonstration routines and some sample sounds. The 'ADD-ON' simply plugs straight onto the back of your SPECTRUM. No soldering is required.

COMPLETE YOUR SPECTRUM NOW!!

JOYSTICKS (POTENTIOMETER-TYPE)
KIT (incl. case) **each £5.35 + VAT** BUILT **each £6.75 + VAT**

NEW **COWBOY SHOOT-OUT**
(Machine Code) **£3.95 + VAT**
Full feature, TWO PLAYER, cowboy shooting game. Hide behind the cactus plants and moving chuck wagons until they are shot away. Shoot your opponent and avoid getting hit yourself. The second player can be the computer, but you set its skill from 10 levels. Excellent colour graphics and sound.



CABMAN (Machine Code) **£3.95 + VAT**
You are the owner of a fleet of yellow taxis. A rival firm competes with you, trying to steal your fares and run you off the road, if they can. Ten skill levels determine the number of opposing taxis, the speed at which they drive and the amount you earn per completed journey. MAXIMISE your earnings before you lose your entire fleet. This program is FIRST CLASS.



MACHINE CODE PROGRAMMERS — ACS SOFTWARE
ASSEMBLER .... NOW ONLY £5.95 + VAT
DISASSEMBLER .... NOW ONLY £4.95 + VAT

BBC, DRAGON & ACORN DEALERS

BOOKS
LARGE RANGE FOR SPECTRUM AND ZX81

VISA

NOTE: We stock (and market) PROGRAM POWER SOFTWARE for the BBC, ACORN, SPECTRUM and DRAGON 32. Send S.A.E. for appropriate catalogue.

MICRO POWER

All programs are now available at all good dealers or direct from MICROPOWER LTD.

Dept.YC4
8/8a REGENT STREET, CHAPEL ALLERTON, LEEDS LS7 4PE.
Tel. (0532) 683186 or 696343

Please add 55p order P & P + VAT at 15%

WRITTEN ANY PROGRAMS! WE PAY 20% ROYALTIES FOR DRAGON, SPECTRUM, BBC PROGRAMS

PROGRAM POWER MICRO POWER

ZX81 SPECTRUM DRAGON TANDY BBC

16K 16/48 32 LEVEL 2 A/B

ADVENTURE

* Over 200 places to explore in this machine code game using advanced data compression techniques.
* No random elements — you will need skill, cunning and a sense of humour as you explore caves, forest and castles.
* Evade ruthless pursuers and overcome a host of obstacles.
* Multiple word commands and single letter abbreviations.

AWARI

* The ancient African game of logic. It takes 2 minutes to learn the rules but far longer to master the tactics.
* Select the 'Goat-herd' level of play and it's an addictive game for children (8+) that exercises their minds — not their laser fingers.
* Select the 'Witch-doctor' level and it's a threat to your sanity. We haven't beaten it and we wrote it!

£1000 IN PRIZES

FANTASTIC VOYAGE (ZX81 16K ONLY)

This real-time graphics simulation set inside the human body was written by a lecturer in anatomy. You are injected into the blood stream in your miniature submarine. Navigate the arteries, veins and heart to the brain, where a blood clot must be destroyed. Features a real vasular map. You will be attacked by lymphocytes which must be destroyed using arcade game type graphics. Everything you do uses up precious energy. Three display formats — a lateral and frontal body scan plus blood vessel name, a close-up scan and a laser-sight for fighting lymphocytes.

** Buy both Awari and Adventure and enter the 'Foilkade Challenge' competition. Details with cassette or send SAE.

FOILKADE LTD

DEPT. PR9
66 LITTLEDEAN,
YATE,
BRISTOL BS17 4UQ

ALL GAMES £5.95 EACH, 2 FOR £9.95, 3 FOR £13.95 (ANY MIX) INCLUSIVE.

SOUND with SINCLAIR

MAKE AMAZING SOUND EFFECTS WITH YOUR ZX 81, TIMEX Sinclair 1000 or SPECTRUM



THE ZON X

£25.95

incl p&p & V.A.T

★ The ZON X SOUND UNIT is completely self-contained and especially designed for use with the ZX 81, TIMEX Sinclair 1000 and Spectrum Computers. It just plugs in — no dismantling or soldering.

★ No power packs, batteries, leads or other extras.*

★ Manual Volume Control on panel — ample volume from built-in loud-speaker.

★ Standard Sinclair — 16K Rampack or printer can be plugged into ZON X Sound Unit without affecting normal computer operation.

★ Huge range of possible sounds for Games, Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gun-shots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords, etc., or whatever you devise!

★ 8 full octaves. Uses 3-Channel sound chip giving programme control of pitch, volume of tones and noises, all with envelope control.

★ Easily added to existing games or programmes using a few simple "BASIC" lines or machine code.

★ No memory addresses used — I.O. mapped.

FULL instructions with many examples of how to obtain effects and the programmes, supplied, fully guaranteed. British Made.

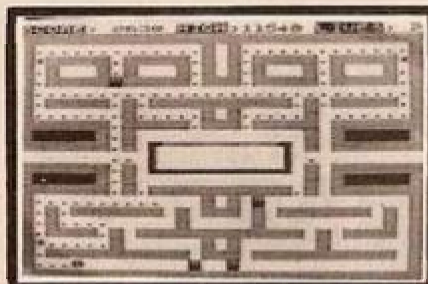
**Except with Spectrum, you need the Spectrum Extension Board Order No. SE1 — Price £6.80 incl. V.A.T.*

Payment may be made by Cheque. P.O. Giro No. 388 7006. Postal Order or Credit Card.

Export orders :— Bank Cheque. International Money Order. U.S. $ or £ Sterling.

BI-PAK Dept YC4 P.O. Box 6, 63A, High Street, Ware, Herts.

Access & VISA accepted Ring 0920 3182 for immediate despatch





NEW! SPECTRUM 16K/48K VERSION £5.95

ZUCKMAN
ZX81 (16K)

*ALL MACHINE CODE (10K)
*FOUR INDEPENDENT GHOSTS
*HIGH-SCORE 'HALL OF FAME'
*AUTHENTIC ARCADE ACTION
*TITLE/DISPLAY MODE

ONLY £5.95 INC. P&P

FROGGY
ZX81 (16K)

*MOVING CARS, LOGS, TURTLES
*ALLIGATORS, DIVING TURTLES
*FOUR 'SCREENS' OF ACTION
*ALL ARCADE FEATURES
*ENTIRELY MACHINE CODE

ONLY £5.95 INC. P&P

NEW ☆ **DRAGON 32 SOFTWARE** ☆ NEW

MISSILE COMMAND .... **ONLY £5.95**
FULL HIGH-RESOLUTION COLOUR GRAPHICS + SOUND

GRAPHICS DEMONSTRATOR .... **ONLY £5.95**
LEARN THE SECRETS OF HI-RES GRAPHICS PROGRAMMING

DJL SOFTWARE

DEPT YC, 9 TWEED CLOSE, SWINDON, WILTS SN2 3PU

TRADE ENQUIRIES WELCOME

Salamander Software DRAGON AND BBC MODEL 'B' SOFTWARE

A Window on Another World

DRAGON 32 SOFTWARE
DRAGON-TREK . . . £9.95 WIZARD WAR . . . £7.95
GOLF . . . £7.95 GRAND PRIX . . . £7.95
GAMES COMPENDIUM D1 . . . £7.95
VULCAN NOUGHTS AND CROSSES . . . £7.95
STAR FIGHTER . . . £7.95

BBC MODEL 'B' SOFTWARE
DRAGON RIDER . . . £7.95 TANKS . . . £7.95
GAMES COMPENDIUM . . . £6.95
EDG GRAPHICS PACKAGE . . . £24.95

Send SAE for catalogue of our full range of Dragon and BBC model B software.
Cheques or postal orders payable to Salamander Software,
27 Ditchling Rise, Brighton, East Sussex BN1 4QL. Tel: 0273 771942.

Please add 50 pence P & P to all orders.
Dealer enquiries welcome. Programers wanted: Good royalties paid.

ELECTRONIC
klik keyboard
AN ALTERNATIVE
NOT AN ADD ON



Installed in 3 easy steps . . .

1. Peel of the touch sensitive key pad.
2. Plug in Klik-Keyboard (no soldering) and place in position.
3. Apply self adhesive two-colour legends to the keys.

This full 40 key keyboard has a positive click feel as the keys are depressed but as it replaces the original touch pad it becomes a permanent part of the ZX81 without bulky boxes or trailing wires.

KEMPSTON
MICRO ELECTRONICS
Dept YC4, 180a Bedford Road, Kempston, Bedford MK42 8BL

LEON NOEL

C10 COMPUTER TAPES

- ☐ TEN CASSETTES PLUS LIBRARY BOXES, SELF ADHESIVE CASSETTE LABELS, & LIBRARY BOX INDEX INSERTS £5.50
- ☐ 20 SELF ADHESIVE CASSETTE LABELS .. £0.90
- ☐ 50 LIBRARY BOX INDEX INSERTS £0.90

ZX81 16K SOFTWARE

- ☐ HANGMAN £3.00
  With this educational game your computer will have 150 words to choose from
- ☐ PONTOON £3.00
  See you get your computer to own you money, not easy, but it can be done
- ☐ BANK ROBBER £3.00
  See how much money you can accumulate before you're caught and sent to jail
- ☐ CASSETTE COVER £3.00
  Put your ZX printer to work and make your program collection look impressive
- ☐ ANY TWO PROGRAMS ON ONE TAPE £5.00
- ☐ ALL FOUR PROGRAMMES ON TWO TAPE'S £8.00

Mail order only — please make cheque/PO payable to:

LEON - NOEL
24 Dudgeon Drive, Littlemore
Oxford, OX4 4QL

All prices include P&P, UK only

FORTH FOR THE DRAGON 32



'DRAGONFORTH' is implementation of Fig-FORTH for the 'DRAGON 32' microcomputer but with a difference.

As well as the enormous power of the FORTH language 'DRAGONFORTH' can also execute BASIC statements. This combines the superb DRAGON sound, graphics and Floating-Point commands with the tremendous speed of FORTH to produce an unparalleled hybrid. You can write a whole program in BASIC or a whole program in FORTH or any mixture of both.

If not already convinced send £2.50 for the 60-page manual (redeemable against first order).

'DRAGONFORTH' is professionally packaged, sensibly priced, guaranteed for life and will be despatched by return complete with free demonstration graphics program.

AUTHORS: Oasis Software will market high quality programs you write in 'DRAGONFORTH'. We pay a lump sum on acceptance and a generous royalty. Let's hear from you!
OASIS SOFTWARE, LOWER NORTH STREET, CHEDDAR, SOMERSET. Telephone 0934-515265.

£18·95
INC. P&P AND V.A.T.

DEALER ENQUIRIES WELCOME

ACCESS ORDERS TAKEN BY PHONE 24 HOURS A DAY

OASIS SOFTWARE

---

campbell systems

THE VERY BEST IN MACHINE CODE FOR THE **ZXSPECTRUM** & **ZX81**

All programs supplied double-recorded and mailed 1st class by return. Prices include VAT and postage within Europe. SAE for full list.

for 48K Spectrum **MASTERFILE** business/domestic filing and reporting system. So flexible that it is equally usable for your mailing lists, catalogues, stock control, text extracts ...... applications are endless. Fully user defined data and report display formats, dynamic variable-length file, records and data items. Fully menu-driven with powerful search facilities, sorting, total/average, update, multiple independent files, printing. Yes, we aim to support microdrive when Uncle delivers. Nearly all the 8K we use is machine code, so you get 32K per file. Comes with example file and 22 page manual. £15.00

NEW Masterfile-16 for 16K Spectrum owners. We have produced a subset version of MASTERFILE called MASTERFILE-16. It has most of the features of big MASTERFILE, with 7 pre-defined report formats and 6 pre-defined fields e.g. name, address, etc., and we have found a useful 4500 bytes of file space. MASTERFILE and MASTERFILE-16 are fully 'file-compatible' and will happily process each other's files, so that 16K owners who upgrade to 48K can use their old files immediately. Complete with 12-page manual, priced at £12.00.

PLEASE REMEMBER TO STATE CLEARLY WHICH VERSION OF MASTERFILE YOU REQUIRE.

for 16K Spectrum **GULPMAN** game of the '.....man' variety with 15 mazes, 4 chasers, laser defence, 9 grades, 9 speeds, demo mode, choice of joystick control. "An extraordinarily good program" raves Boris Allan for Popular Computing Weekly. We think you will agree. £5.95

for 16K ZX81 **GULP 2** almost identical spec to GULPMAN. £4.75

for 16-64K ZX81 **THE FAST ONE** is the predecessor to MASTERFILE and is in use all over the world now. Specification is very similar to MASTERFILE. £12.00

Campbell Systems, Dept.(YC),
15, Rous Road, Buckhurst Hill,
Essex, IG9 6BL, England.
Telephone: 01-504-0589

CS

NEW

From Warp Factor Eight

Lift-off into '83 with **HI-STAK**



ONLY £3·95 includes VAT, p&p

- makes your computing easier, faster, more reliable, less exhausting and simply more enjoyable.
- angles your computer neatly to the correct ergonomic position for the most efficient keyboard operation.
- provides extra ventilation for hot ZX81's and Spectrums.
- instantly applied.
- styled for '83, adds that professional look to your set up.
- precision injection moulded in quality ABS, non scratch – non slip base.

ZX81
SPECTRUM
VIC20
TRS80
NEW BRAIN
JUPITER ACE
Etc.

Order form. Please send me ____ HI-STAK set(s) (at £3.95 per set). I enclose cheque/P.O. for ____

Name ____

Address ____

____

____ Post code ____

To: Warp Factor Eight, Dept. YC.
6 Pelham Road, Braughing, Ware, Herts. SG11 2QU.

M.C. LOTHLORIEN



a prophecy with hindsight for all **SINCLAIR** and **DRAGON** owners



BEWARE THE IDES OF MARCH!

ROMAN EMPIRE The prophecy might be a bit late, but then it did not help Julius Caesar anyway! Late or not it is never too late to discover the challenge of Roman Empire, our largest selling Spectrum game. It will test your generalship as you build your armies, and fight campaigns in your attempt to conquer armies in provinces of the Roman Empire. This challenging game takes full account of troop morale, fighting efficiencies, leadership ability etc. Three levels of play giving many hours of satisfaction. You may find you were born a mere 2000 years too late! SPECTRUM 16K ZX81 16K, also DRAGON 32.

TYRANT OF ATHENS
(Dragon, ZX81 and Spectrum)

Can you survive long enough to turn Athens into the most feared state in the Mediterranean? Train troops, build warships, fight battles by land and sea against hostile Greek States and vast Persian Empire. Many more features in this, our best selling game. (Dragon version available).

SAMURAI WARRIOR
(Dragon, ZX81 and Spectrum)

How would you have fared as a Samurai in 13th Century Japan? Face challenges from other Samurai, give aid to villages and resist attacks by groups of marauding bandits. 7 levels of play, a most fascinating game. Are you a survivor or will you commit ritual suicide? (Dragon version available)

PELOPONNESIAN WAR
(ZX81 and Spectrum)

Set during the great war between Athens (you) and Sparta. You must use all your resources of troops, warships and diplomats and your struggle to gain the alliance of the other neutral states, before the final battle. Three levels of play, instructions contain map of Greece for reference.

Also available: **WARLORD** for ZX81 16K and DRAGON set in 13th Century Japan.

All games contain comprehensive playing instructions and they play differently at each level (where applicable) and on each occasion. All ZX 81 need 16K Ram. All Spectrum will run on 16 or 48K. PRICES: SPECTRUM **£5.50**: Zx 81 **£4.50**: DRAGON **£6.95**

ACCESS NUMBER OR CHEQUES AND PO'S PLEASE MADE PAYABLE TO:

M.C. LOTHORIEN

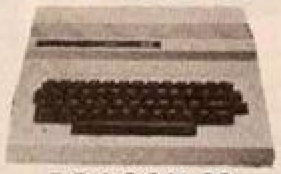
Dept YC4, 4 Granby Road, Cheadle Hulme, Cheadle, Cheshire SK8 6LS.

NOW AT LAST!
LOW COST WORDPROCESSING

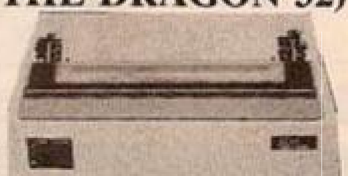
(UNDER £500 ON THE DRAGON 32)



PROGRAM TAPE & MANUAL
£43.48 + VAT



DRAGON 32
£173.48 + VAT
PRINTER CABLE
£13.04 + VAT



MICROLINE
M80
PRINTER
£199.00 + VAT

TELEPHONE FOR
*** PACKAGE DEAL ***
PRICES



SINCLAIR
ZX81



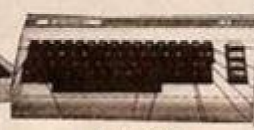
SINCLAIR
SPECTRUM



COLOUR
GENIE



BBC
MICRO



VIC64



ORIC 1



NEW BRAIN

TELEPHONE FOR
*** CURRENT PRICES ***



SEIKOSHA
GP100



EPSON RANGE



AMBER 2400

* MAIL ORDER & CREDIT FACILITIES AVAILABLE * LARGE RANGE OF SOFTWARE *

MEDWAY COMPUTERS

141 NEW ROAD, CHATHAM, KENT TEL. (0634) 826080/ 681547

THE FLEXIBLE COMPUTER SYSTEM FOR THE FUTURE

ORIC-1

CREATED BY TANGERINE

How can Tangerine promise you a professional computer for only £99.95? Because, unlike most computer builders, we have designed the U.L.A. ourselves.

This makes the ORIC-1 substantially more reliable and versatile to work with and what's more, at £99.95, you get a professional system well below the price of all leading manufacturers.

We can give you prompt service, quality, reliability and full technical backup: The ORIC Computer System will guarantee you that and more:

- 8 colour graphic display (8 foreground + 8 background)
- 40 character by 28 line colour text display
- High resolution graphics (240/200 pixels) 240 across screen, 200 down
- 96 User defined graphics symbols
- Microsoft BASIC software
- 6 octaves of music with Hi-Fi output and 4 preset sound effects – Shoot, Explode, Ping, Zap
- Centronics printer interface (compatible with a whole range of standard printers)
- Optional Communications Modem (allowing access to 200,000 pages of Prestel and direct link with other computers)
- Typewriter style keyboard
- Professionally written user manual by well-known computer authors
- Oric Owner Magazine included with each ORIC 1 purchased
- Tan-Forth supplied free with every mail order 48K Model
- Extended Basic (BBC etc) available soon
- Full range of business and leisure software coming shortly.



ONLY £99.95 (inc. VAT) FOR 16K RAM VERSION

(Please allow 28 days for delivery) **Subject to availability**

Order your ORIC-1 direct from the designers

BY POST: You can pay by cheque, postal order, ACCESS – BARCLAYCARD-VISA

BY PHONE: Just ring our telesales number ELY (0353) 2271/2/3/4

Please delete/complete as applicable.
*I enclose a cheque/p.o. payable to TANGERINE COMPUTER SYSTEMS LTD. For £
Please charge my Access, Barclaycard, Visa No.

Name
Address

If you require a VAT receipt please tick ☐

Please send me a full colour brochure ☐

Item	Qty	Price Inc. VAT	Total
ORIC-1 16K RAM		£99.95	
ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£79.00	
ORIC Owner Magazine (Bi-monthly)		£10.00	
Postage and packing		£5.95	
		TOTAL £	

TANGERINE COMPUTER SYSTEMS LTD. 3 Club Mews, Ely Cambs CB7 4NW

South London's Largest Micro Computer Centre

VISION STORE

In Stock Now

COMMODORE 64



64k £339.95

Vic20 5k **£129.95**
21k **£169.95**
includes 5 Free programmes.

VIC Cassette **£44.00**
VIC Printer **£229.00**
VIC 1541 Disk Drive **£299.95**
16K RAM Pack (Switchable For 3K Programs) **£39.95**
16K RAM Pack (Expandable To 24K) **£49.95**

Ideal for Commodore computers

NEW **Seikosha GP100** VC Printer **£239.95**
Commodore 64 Software Now in Stock

Main Commodore Dealer for

New 500 series, New 700 series Business Computers.

ATARI 400



16K £159.95 Less Basic

48K £229.95 Less Basic

Programmer Kit **£39.90**
48k Up Grade for Atari 400 **£73.50**

Atari 800 16K inc basic **£399.00**
Atari 800 48K inc basic **£469.95**
Atari 410 Cassette **£49.00**
Atari 810 Disk Drive **£299.00**
Atari 822 Printer **£199.95**

Plus Daisy Wheel and Dot Matrix printers for the Atari range From **£99.95**

NEW **Atari 400** Typewriter keyboard. Direct easy replacement for standard keyboard **£78.95**

New Vic Software

Krazy Kong!
Dodge Kong's barrell's as you climb the stairs.
STD VIC. Joysticks. **£6.99**

Exterminator!
Blast the centipede while dodging the spider amongst the toadstools. Fast action.
STD VIC. Joysticks **£6.99**

Anti-splatter-matter!
Make space invaders look like childs play, superb graphics.
STD VIC. Joysticks. **£6.99**

Vikman
Choose one to three ghosts.
STD VIC. Joysticks **£6.99**

3-D Man
Brilliant! You are down in the maze like a Pac-Man, dodge the ghosts and find your way out!
Expanded VIC Joystick **£9.95**

Motorway Maniac
Accelerate towards on-coming traffic while dodging from lane to lane!
Expanded VIC Joystick **£9.95**

Defender on Tri
Guide your ship through the maze on 4 different screens. Fantastic colour and graphics.
Expanded VIC Joystick **£9.95**

100's of other programs.
Send for VIC price List.

Largest Stocks of Software in South London. Available on Cassette, Disk or Cartridge. Massive ranges for:
Atari, Spectrum, ZX81, BBC and Dragon.

Printers

We carry a wide range of printers including:

Amber Dot Matrix	£89.95
Seikosha GP100A	£229.95
Epson MX80FT3	£389.95
Smith-Corona Daisy Wheel	£549.95

Cables and interfaces for most home micro's in stock.

THE AMAZING ORIC-1



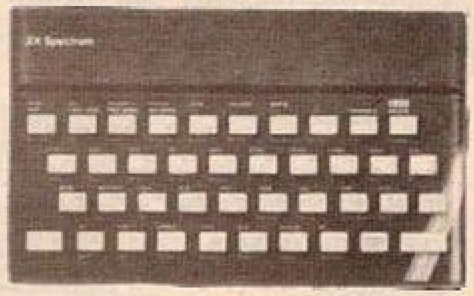
Colour Computer

* **40 Columns × 28 rows.**
* **Microsoft Basic**
* **8 Colours.**
* **Built-in Sound Synthesiser.**
* **High Res Graphics.**

48K Microsoft Basic **£169.95**
16K Microsoft Basic **Phone!**

Come in for a Demonstration.

Sinclair Spectrum Colour Computer



16K **£123.95**
48K **£173.95**

We carry massive stocks of Software for the Spectrum.

Sinclair ZX81 **£49.95**
16K RAM **£27.95**
Printer **£59.95**

DRAGON 32 £198.95

64K Upgrade/Disc Drive place your order now

Limited stocks available. New software coming in all the time. Come in for a demo or send for our list.

Export

All our hardware and software is available Tax-Free to overseas customers, please send for our comprehensive list.

Epson HX-20 plus wide range of software in stock now.

Over 900 software programmes always in stock. We carry probably the widest range with continuous demonstrations.

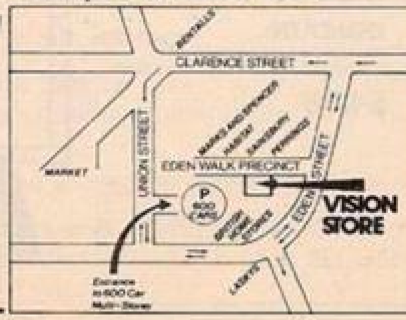
We offer excellent part exchange deals or cash for your old machine.

Mail Order — send for our comprehensive list.

Ask about our Credit Facilities

Access/Barclaycard

Prices correct at time of going to press but subject to change without notice.

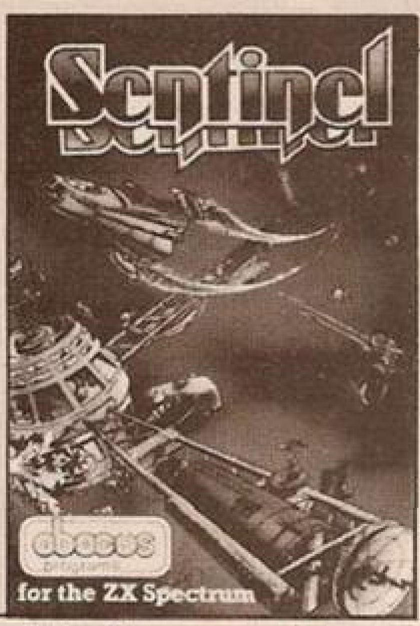


VISION STORE

3 Eden Walk Precinct, Kingston-on-Thames, Surrey. Tel: 01-546 8974

All our prices include VAT

3 GREAT EXCITING GAMES







SENTINEL written by Kevin Flynn

for the ZX Spectrum

SENTINEL is an entirely original **ARCADE STYLE** game, written in MACHINE CODE to give fast action-packed performance. The gateway to your galaxy is guarded by the Sentinel System. Only your skill and initiative stands between the advancing enemy's space fleet and the destruction of the galaxy. You have 4 space ships per station each armed with photon-cannons and guided missiles. Make use of the Force Field when ever possible.

Only £5

AVENGER written by Kevin Flynn

- **for the ZX Spectrum (16/48k RAM)**
- **for the ZX81 (16K RAM)**

FEATURES

- ARCADE ACTION
- Eight different types of target.
- Rapid manouvering of ship.
- Quick firing of bombs and lasers.
- 'Intelligent' alien interceptors.
- Realistic bombing trajectory.
- Continuous display of MISSION TIME, SCORE, SHIELD & LASER TEMPERATURE.
- End of mission report.
- Five levels of play.
- Full useof sound effects and colour.

Only £5

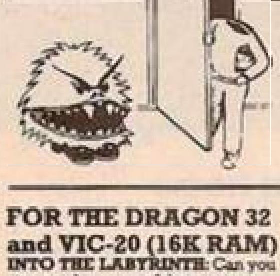
PROTECTOR written by Kevin Flynn

for the ZX81 (16K RAM)

Protector is written in MACHINE CODE to give an **arcade style** all action game. Using the Sentinel's laser you must defend the planet Zargon from the aliens which are bombing the planets vital installations. On screen Alien score, your score, number of shields left and number of Laser shots. Watch out for the Damacles Missile which may be detonated at the alien commander's discretion.

Only £5

Other Abacus Games



BODYBUILDER: VIC-20 (6½K RAM)

I don't know whether I'm coming or going. So many doors - so many monsters chasing me. Somebody must have my head....my arm....my leg....

£4.50

FOR THE DRAGON 32 and VIC-20 (16K RAM)

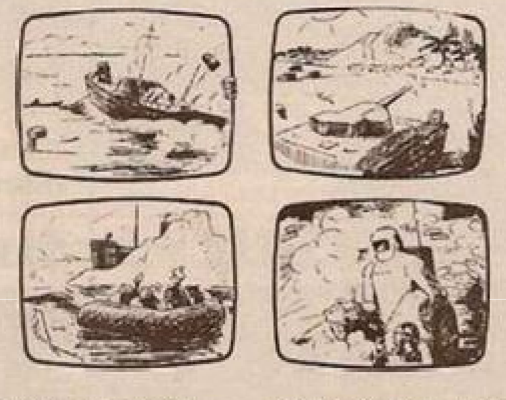
INTO THE LABYRINTH: Can you escape the curse of the sorcerer SKAROTH?

A gripping ADVENTURE game with 38 locations to explore, 40 objects to find and manipulate. There is a limit to the number of moves you can make before the curse kills you. At least 13 ways to lose, but only one way to win......frustration guaranteed.

- **also 13 magical events**



Only £5.99



SPECTRUM GAMES PACK 1

DESTROYER: Listen to the beeps of the sonar to locate and destroy the submarines before they sink the merchant ships.

ICEBERG: Steer your icebreaker through thickening pack ice to pick up survivors.

BATTLE: Destroy missile sites while avoiding mines and the computerised enemy tanks that are out to get you.

ANDROID PIT RESCUE: Rescue the miners before they are trapped in the flooding mines.

All four on one cassette at the incredible price of **£4.95**



MICROMUSIC: VIC-20 (6½K RAM)

No previous knowledge of music is necessary to use this entertaining and educational program. Create music speedily and easily using standard notation. A must for the budding maestro.

£4.50

ABACUS CONTROLLER

Developed to eliminate tedious swapping of plugs when LOADING or SAVING programs on cassette.

ZX SPECTRUM CONTROLLER: Single switch selection of SAVE, LOAD & AMP modes. Built in amplifier and loudspeaker boosts Spectrum sound output. Price £14.96

ZX81 CONTROLLER: Single switch selection of TALK, SAVE, CUE & LOAD modes. Built in microphone/speaker for fast and reliable program naming and cueing. Price £9.96



"Of all the Spectrum hardware Items I have reviewed, this one most impressed me and is the only one I shall always use."
Quote from PCW.

- **For the youngest spectrum user.**

SPECTRUM GAMES PACK 2

NINE LIVES:
Catch the mice before the dog catches you. Six levels of play.

BULL TABLE:
Do your sums quickly before the Bull upsets your table. Seven levels of play.

CANDYMAN:
Race your men through the moving maze. A great game for two players.

TARGET:
All the fun of the fair.

All four games on one cassette for £4.50

ESP ZX81 (16K RAM)

An exploration of INNER SPACE. Undertake a serious investigation of your own Extra Sensory Perception. Test your family and friends - an educational and scientific experience. **ESP Package** includes **two** 16K programs with commentary.

£4.95

DOMAIN:

Probably the best version of **Kingdoms** you are ever likely to see.

£4.95

WANTED original **Machine code** Programs.
We guarantee to better all other offers. Write now for further details.

View before buying - Selected items from this advert are available at most branches of W.H.SMITH, the BUFFER SHOP LONDON and JAY DEE COMMUNICATIONS PORT TALBOT.

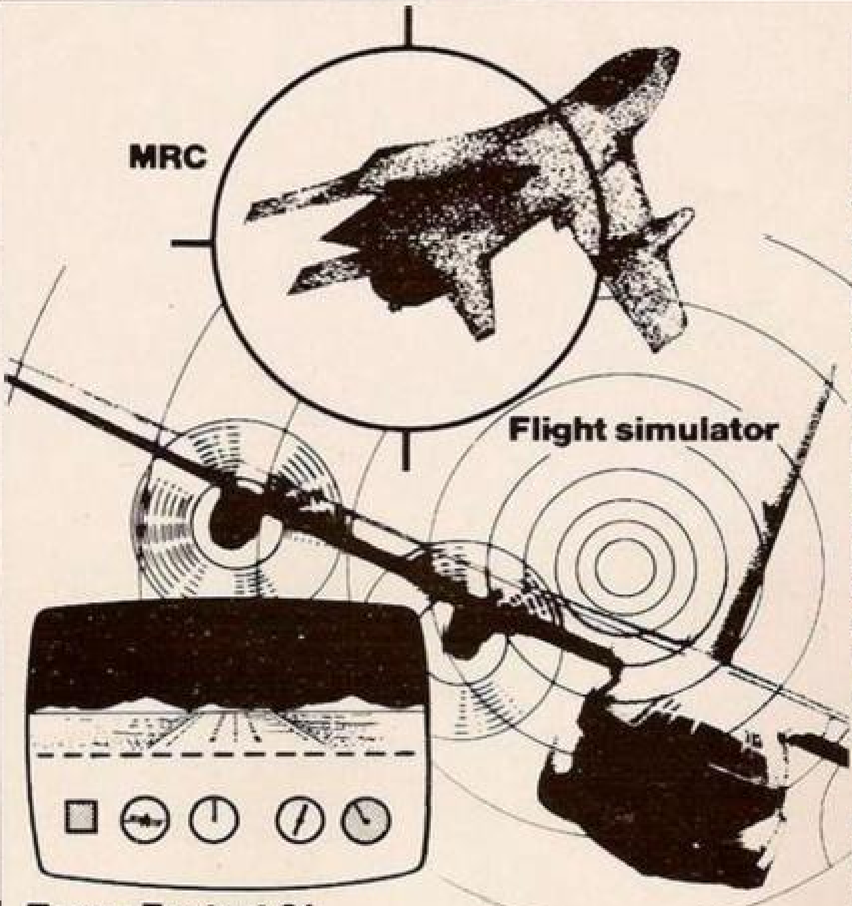
MONEY BACK GUARANTEE. CASSETTES DESPATCHED WITHIN 48 HOURS.

All prices inclusive of p&p. Send cheque or PO to:

abacus programs

186 St. Helens Avenue, Swansea, W.Glam. Tel:(0792) 50282

Abacus Programs



DRAGON 32 Cassettes

MRC
Air combat and ground strike, "joystick" controlled sights cannon fire and bomb release. Full colour hi-res graphics 3D and sound **£6.50** *inc. p & p.*

Fruit
Compulsive, addictive, fruit machine. Using your skill with the holds, turn your £5 stake into £10 and beat the system. Hi-res graphics and sound. **£4.95** *inc. p & p*

Look and Learn
Educational picture recognition. Hi-res graphics, text and colour. Age 3–10yrs **£4.95** *inc. p & p.*

Pontoon
Super Hi-res graphics, full colour definition and card display. Fascinating, absorbing **£4.95** *inc. p & p.*
DRAGON and ORIC "JUNIPER" word processor, comprehensive edit facilities, menu and cursor driven **£25.00** *inc. p & p*

Tango Foxtrot 01
Using your skill, locate the airstrip with the radar scanner, fly your aircraft through hazardous crosswinds and air pockets to land safely. Watch your fuel; watch your artificial horizon; be sure you are level on final approach. Full colour, hi-res graphics, 3D and sound. **£6.50** *inc. p & p*

QUARK DATA P.O. BOX 61, Swindon, Wilts. Tel. (0793) 40661.
Please supply . . . .
. . . .
. . . .
Cheque for total amount enclosed . . . .
Name . . . .
Address . . . .
. . . .

SPECIAL OFFER! Deduct £1 per cassette or disc when ordering 2 or more.

QUALITY SOFTWARE FOR THE BBC MICRO

ROAD RUNNER (32K) £6.50 Cassette/ £9.90 Disc
The only full feature machine-code version of the arcade game available for the BBC micro. Features include: scrolling screen, radar display, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty and sound effects.
GALAXIANS (32K) £6.50 Cassette/ £9.90 Disc
Fast action version of the popular arcade game. 4 types of Galaxian (in 3 initial screen formations) swoop down individually or in groups of two or three. 6 skill levels, hi-score, rankings, bonus laser bases, increasing difficulty, superb graphics and sound.
CENTIPEDE (32K) £6.50 Cassette/ £9.90 Disc
Incredible arcade type game featuring mushrooms, flies, snails, spiders, and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more active and the mushrooms increase.
FRUIT MACHINE (32K) £6.50 Cassette/ £9.90 Disc
Probably the best fruit machine implementation on the markets. This program has it all . . . HOLD, NUDGE, GAMBLE, moving reels, realistic fruits and sound effects, multiple winning lines. This is THE fruit machine program to buy.
ALIEN DROPOUT (32K) £6.50 Cassette/ £9.90 Disc
Based upon the arcade game of ZYGON, but our version improves upon the original arcade game itself. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground. Suiteable for use with keyboard or joystick.
INVADERS (32K) £6.50 Cassette/ £9.90 Disc
Superior version of the old classic arcade game including a few extras. 48 marching invaders drop bombs that erode your defences, and 2 types of spaceship fly over releasing large bombs that penetrate through your defences. Hi-score, increasing difficulty, superb sound effects and graphics.
SPACE FIGHTER (32K) £6.50 Cassette/ £9.90 Disc
Arcade-style game based upon features from DEFENDER and SCRAMBLE. 5 types of menacing alien fire at you and may attempt to ram you. Separate attack phases, fuel dumps, asteroids, repeating laser cannon, smart bombs, hi-score, rankings, 6 skill levels, bonuses.

WE PAY 25% ROYALTIES FOR HIGH QUALITY PROGRAMS
Please add 50p per order for p. & p. + VAT at 15%
***Dealer enquiries welcome

SUPERIOR SOFTWARE
Dept. YC6
69 Leeds Road,
Bramhope, Leeds.
Tel: 0532 842714

DISC SOFTWARE AVAILABLE NOW!

JOIN THE DRAGON USERS, and

TAME THAT DRAGON



Dragon Users get a monthly publication packed with programs, hardware tips and information about the Dragon 32.

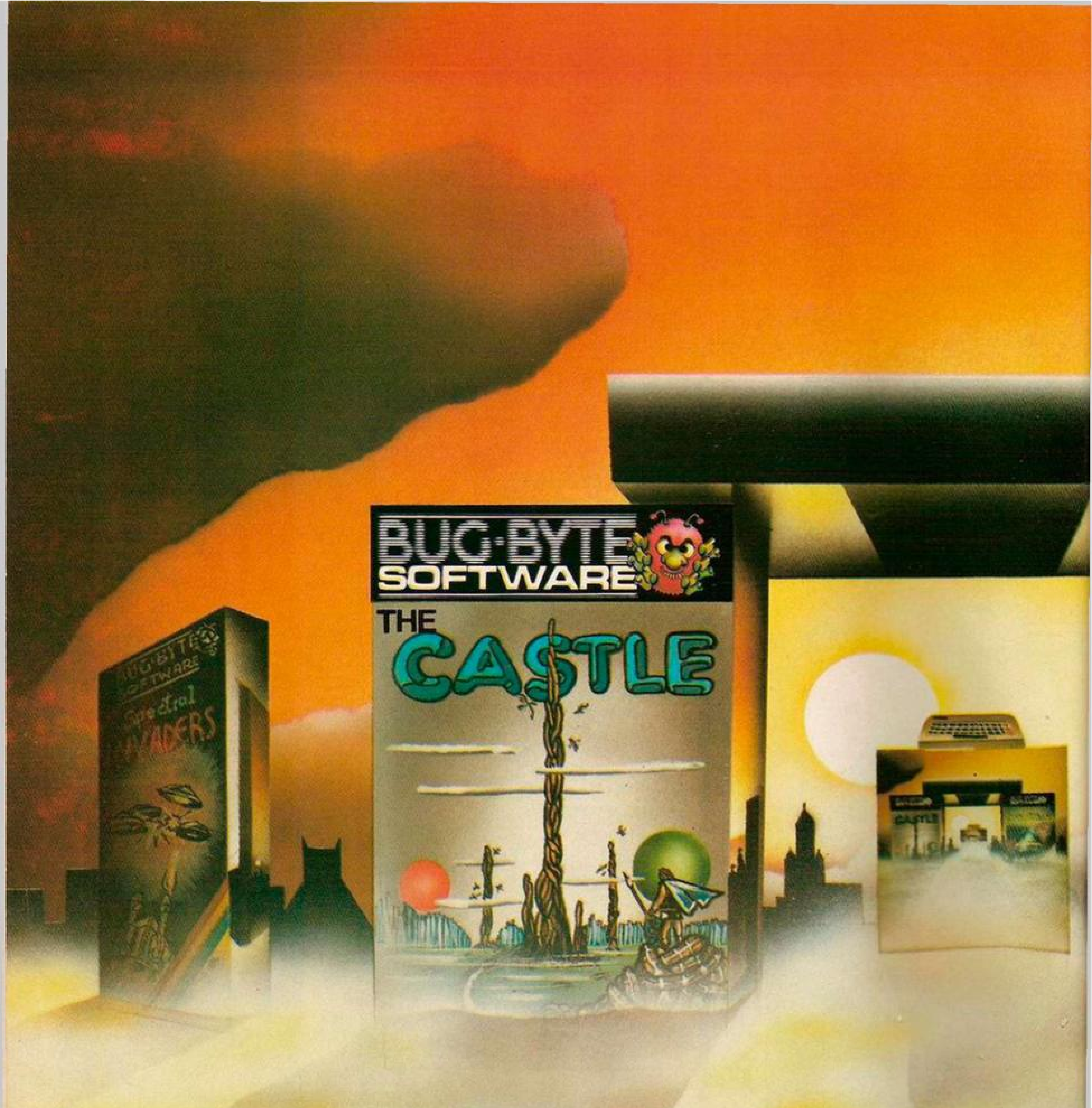
Dragon Users will be able to buy high quality software produced by our team of professional programmers at special discounts.

Plus a whole lot more.

It costs £10 to become a Dragon User, which includes a subscription to our high quality publication (£20 for overseas readers).

Make out cheques and postal orders to:

Co-Operative Computers and Communications Ltd
20 Wynford House, Wynford Road, London N1 9QY



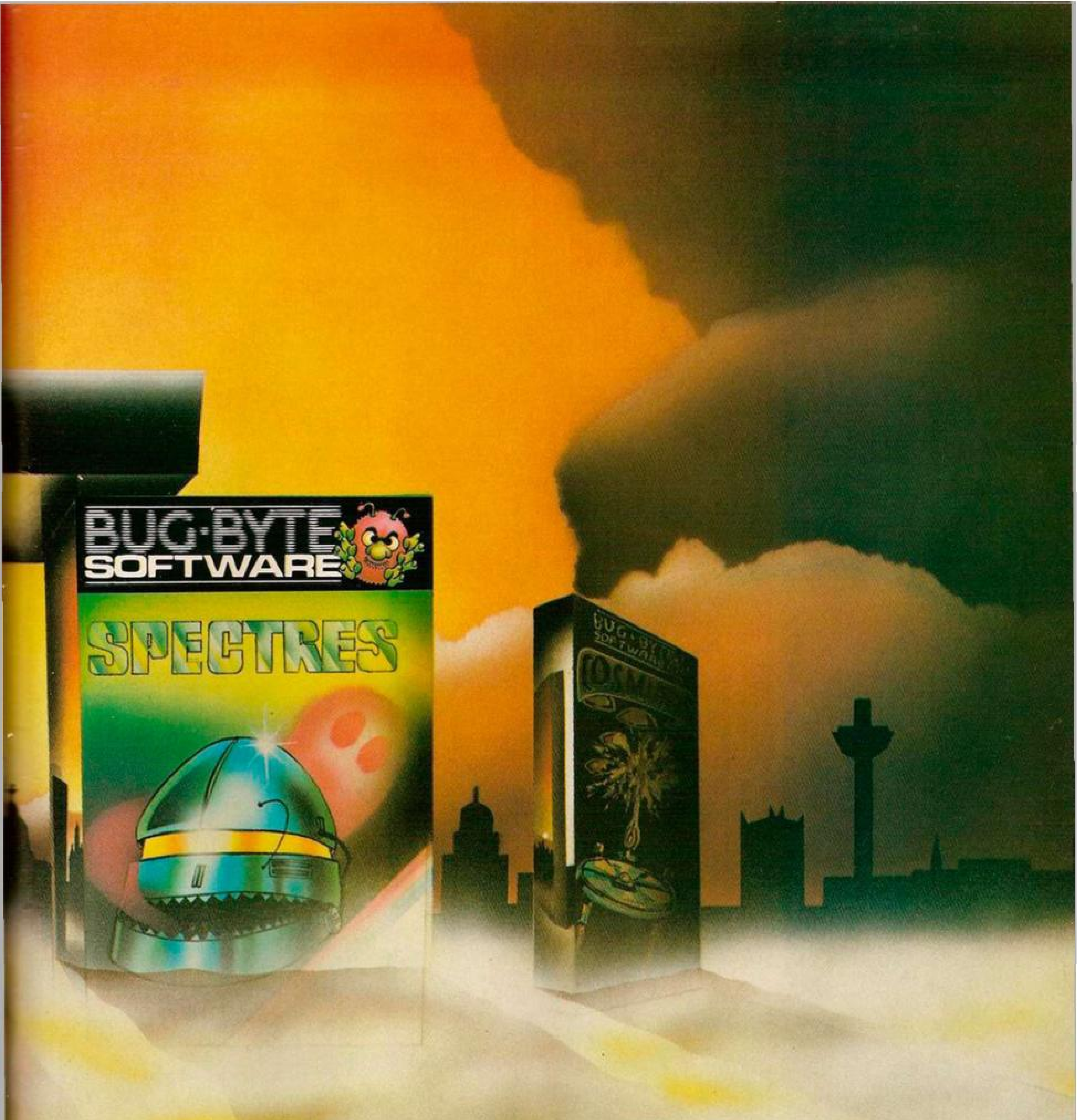
BUG-BYTE SOFTWARE, MORE THAN A GAME

All about me was darkness. Tens of thousands of screens stared blankly into space. Minds drifted aimlessly, dulled by lack of stimulation. The world was grey, drab, lacking . . .

Then suddenly it happened. First one, then another, then tens, hundreds, thousands of tired screens felt a surge of power and flickered back into life. They were much as I had seen on my own planet's microcomputers – the ZX 81, ZX Spectrum, Vic 20, BBC Micro and ORIC-1.

The minds paused to take stock. They clustered round the screens, their nimble fingers excitedly flicking the controls back and forth. At last they had found a challenge . . . action and adventure with cunning tests of dexterity and reaction. Everywhere, conversation was of Asteroids, Mazogs, Panic, Another Vic in the Wall.

Unable to resist, I too had a closer look. There before me was vivid colour, high resolution graphics. I could practically feel the spine-tingling



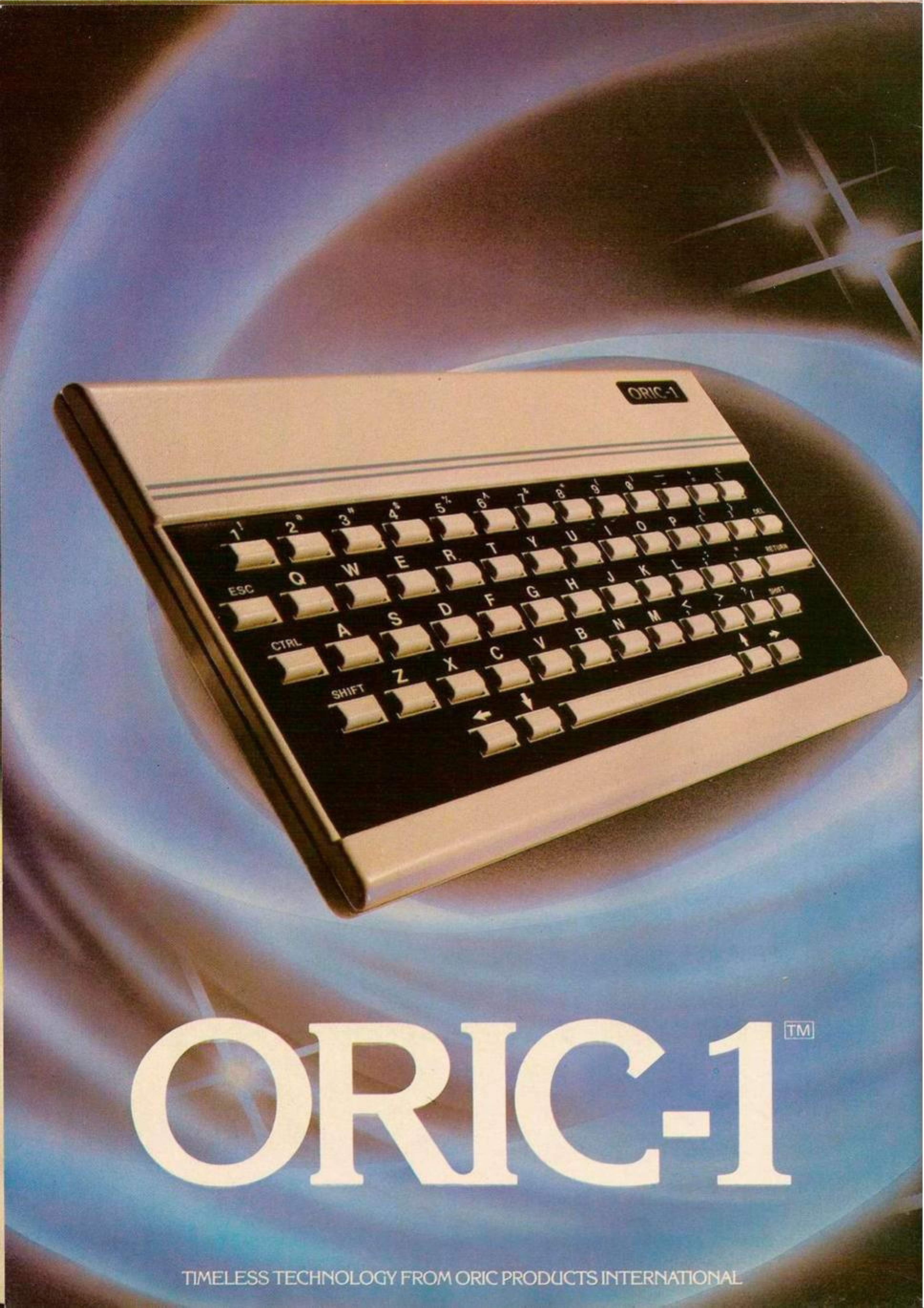
...IT'S A DOOR TO ANOTHER DIMENSION !

sound effects as whole battle fleets of Cosmiads swarmed out of nowhere and attacked. I should have known. As my fingers raced over the controls, and I prepared to stand and fight with only a single laser bolt for protection, I realised I was trapped!

Too late now, I remembered this was no ordinary software. I'd been warned, as I now warn anyone buying from Laskys, W.H. Smith, Currys Micro C, Spectrum and larger branches of Boots, and a nationwide network of dealers stocking Bug-Byte. Because Bug-Byte is more than a game, it's a door to another dimension. One that I had opened.

BUG-BYTE SOFTWARE

100 The Albany, Old Hall Street, Liverpool L3 3AB


ORIC-1
ORIC-1™
TIMELESS TECHNOLOGY FROM ORIC PRODUCTS INTERNATIONAL

The Computer Challenge

16 colours
professional keyboard
full graphics
real sound

- Superb styling
- Choice of 16K RAM or massive 48K RAM
- Ergonomic keyboard with 57 moving keys
- 28 rows x 40 characters high resolution
- Teletext/viewdata compatable graphics
- 6 octaves of real sound plus Hi-Fi output
- Centronics printer interface and cassette port
- Comprehensive user manual

THE REAL COMPUTER SYSTEM FOR £99.95 incl VAT

OPTIONAL MODEM OFFERS COMPUTER PHONE LINK FOR:
● ELECTRONIC MAIL ● TELESOFTWARE ● PRESTEL

COMING SOON, TO COMPLETE YOUR SYSTEM: ORIC MICRO-DRIVE DISCS & SPEED PRINTER

FOR HOME: The ORIC-1 is the professional alternative for home computing. Superbly styled, the 57 key layout is based upon computers costing many times more than the ORIC, and will help the whole family to learn and understand computing, right from day one. The ORIC incorporates an improved version of Basic for ease of programming and use. For the enthusiasts the computer has laser zaps, explosions, etc. pre-programmed for games use, with Hi-Fi output for incredible effect. The communications Modem will allow 'Telesoftware', message sending, and Prestel use.

FOR BUSINESS: The ORIC-1 is the answer to many day to day problems. Software is becoming available for payroll, accounts, stock-control, and many more systems to help your day to day business organising and control. In addition, the ORIC COMMUNICATIONS MODEM will allow you to access up to 200,000 pages of Prestel information, to send and receive 'electronic mail', to book hotels, and flights (and pay for them) and to look at the latest stock-market and share indexes.

In short the ORIC-1 is a must for all businesses large or small.

HOW TO ORDER YOUR ORIC-1: By phone: Just ring our telesales number Ascot (0990) 27641.

By post: You can pay by cheque, postal order ACCESS – BARCLAYCARD – AMEX – DINERS.
(Please allow 28 days for delivery).
Money back if not satisfied.

© Copyright ORIC PRODUCTS INTERNATIONAL 1982

ORIC-1
The Real Computer System

ORIC PRODUCTS INTERNATIONAL LTD Coworth Park Mansion, Coworth Park, London Road, Sunninghill, Ascot, Berks SL5 7SE.

Item	Qty	Price Inc VAT	Total
ORIC-1 16K RAM		£ 99.95	
ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£ 79.95	
Postage and Packing			£ 5.95
		TOTAL £	

Please charge my Access, Barclaycard Amex, Diners Club account no.

Name

Address

*Please delete/complete as applicable.
*I enclose a cheque/ P.O. payable to: ORIC PRODUCTS INTERNATIONAL LIMITED for £______

If you require a brochure please tick ☐

YC4

All the best sellers...

For all home micro-users who don't live near one of the larger city branches of Boots or W. H. Smith, and who find difficulty in purchasing the very latest, best-selling software – here is the answer!

Software Express is the new, mail-order arm of a £12 million group of companies. We have just signed an agreement with Bug-Byte, Britain's most successful software house, to supply their exciting products direct to you, the user. New and original games for the ZX81, Spectrum, BBC Micro, VIC 20 and Oric 1 can be delivered to your door AT SHOP PRICES. That's right, positively no extra charges – we even pay the postage both ways!

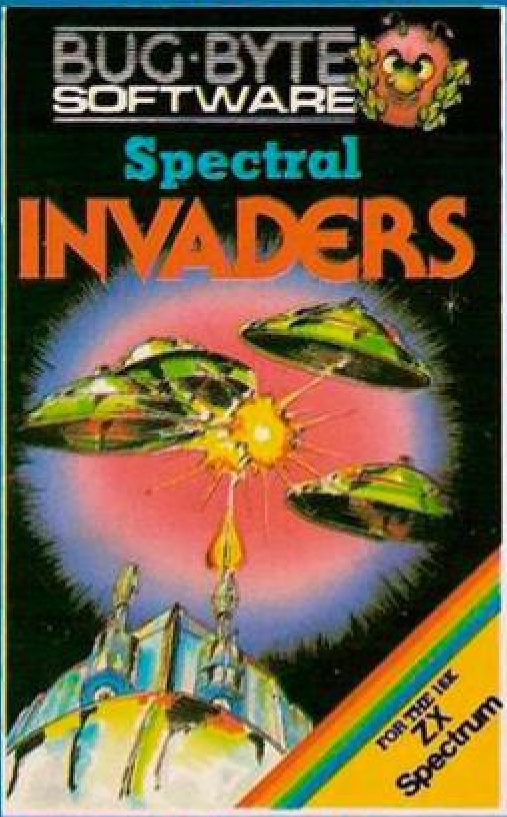
All you have to do is make your selection from the items listed on this page, complete the easy reply coupon, and send it to our FREEPOST address (no stamp required), enclosing your cheque, postal order, or credit card number for the appropriate amount. Alternatively, you may place your order on our 24 hour Ansaphone by phoning in your Access/Barclaycard number with your name, address and details of your order.

The cassettes of your choice will be mailed to you quickly and efficiently. No cheques will be cashed prior to despatch of your order, and if for any reason you are not satisfied with your purchase, we will give you a full refund just as quickly.

It's so simple! The best quality software, promptly and conveniently at no extra cost from Software Express. Try us and see for yourself – we go out of our way especially for you.

BEST SELLER

FOR THE ZX SPECTRUM

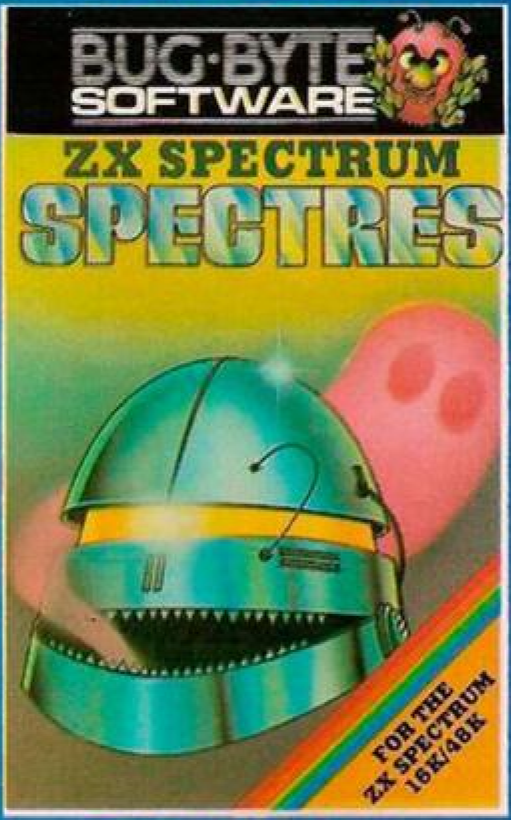


FOR THE ZX SPECTRUM

PRICE £5

BEST SELLER

FOR THE ZX SPECTRUM

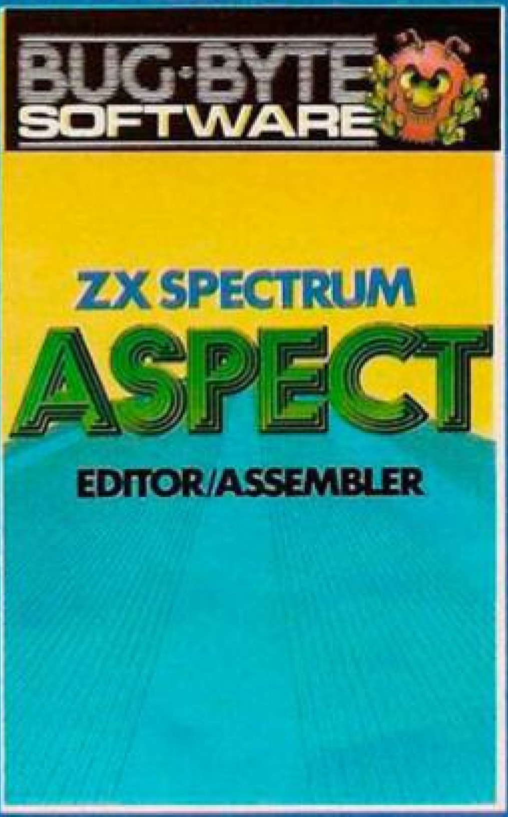


FOR THE ZX SPECTRUM

PRICE £8

NEW IMPROVED VERSION

FOR THE ZX SPECTRUM

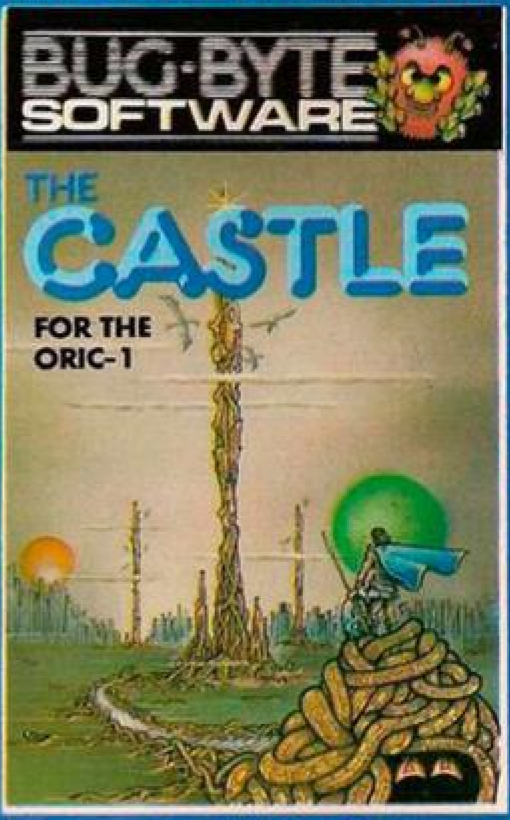


FOR THE ZX SPECTRUM

PRICE £9

BRAND NEW PROGRAM

FOR THE ORIC 1



FOR THE ORIC 1

PRICE £8

OTHER TITLES AVAILABLE FROM SOFTWARE EXPRESS...

FOR THE VIC 20 . . .

VIC Chess–£7. VIC Asteroids–£7. VIC Panic–£7. VIC Cosmiads–£7. Another VIC in the Wall–£7. VIC Backgammon – £7. VIC Scramble – £7. All programs are for the unexpanded VIC 20, with the exception of Chess (16K) and Backgammon (min. 3K expansion).

FOR THE ZX81 . . .

Mazogs – £10. Dictator – £9. Invaders – £4.
ZXAS (Z80 Assembler) – £5.
ZXDB (Z80 Debugger) – £6.50.
ZXTK (Z80 Toolkit) – £6.
(all programs are for the 16K – ZX81).

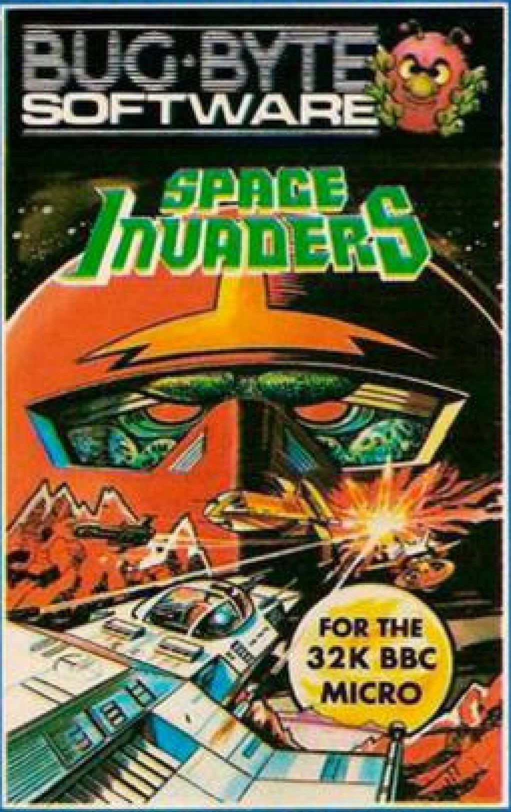
Only programs listed on this advertisement are available from Software Express. For other items in the Bug-Byte Catalogue see your nearest dealer.

All dealer enquiries to: Bug-Byte Software, 100 The Albany, Old Hall Street, Liverpool L3 9EP.

.direct to your door!

ALL TIME FAVOURITE

FOR THE BBC MICRO

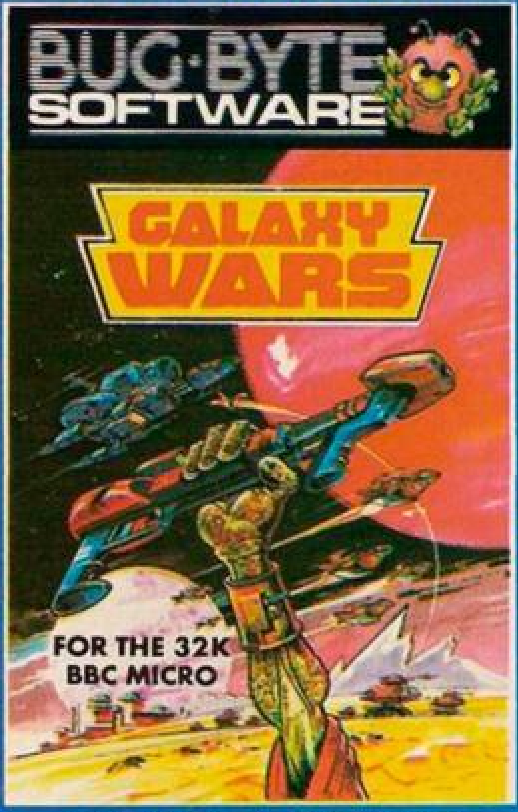


FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO

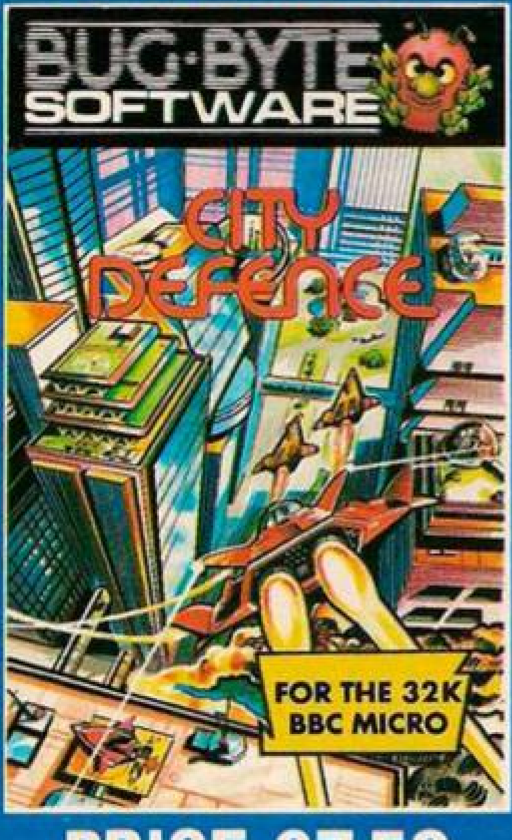


FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO

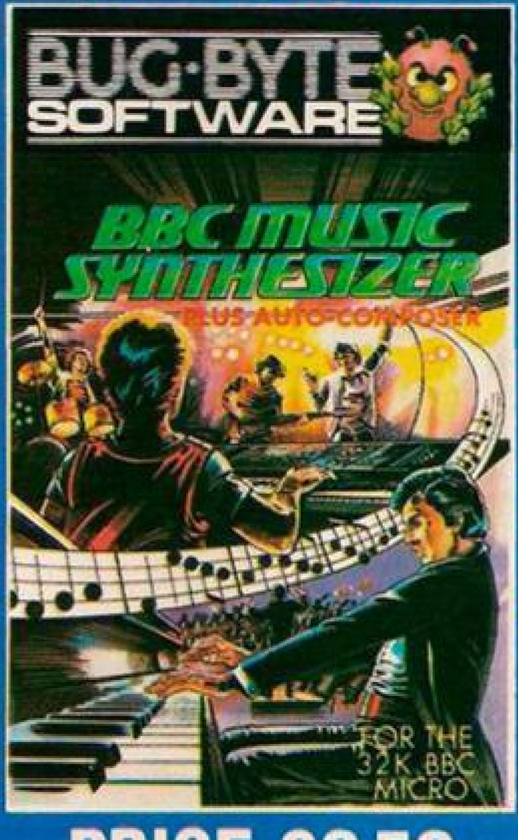


FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO



FOR THE BBC MICRO

PRICE £9.50

SOFTWARE EXPRESS

FREEPOST (No Stamp Required). Gores Road, Kirkby industrial Estate, Kirkby, Liverpool L33 7UA.
Software Express is a trading name of DAMS Office Equipment Liverpool.

THE SOFTWARE EXPRESS EASY-REPLY COUPON

Please mail me the following Software Cassettes.
(All prices include VAT and postage).

PROGRAM	PRICE	INSERT QUANTITY
SPECTRAL INVADERS	£5	
SPECTRES	£8	
ASPECT	£9	
THE CASTLE	£8	
SPACE INVADERS	£7.50	
GALAXY WARS	£7.50	
CITY DEFENCE	£7.50	
MUSIC SYNTHESIZER + AUTO COMPOSER	£9.50	
OTHER ITEMS		

TOTAL PRICE £

I enclose cheque/P.O. for ____________

Or please charge my Credit Card No.

Access/
Barclaycard only please.

24 HOUR ANSAPHONE FOR CREDIT CARD ORDERS:

051-548 2020

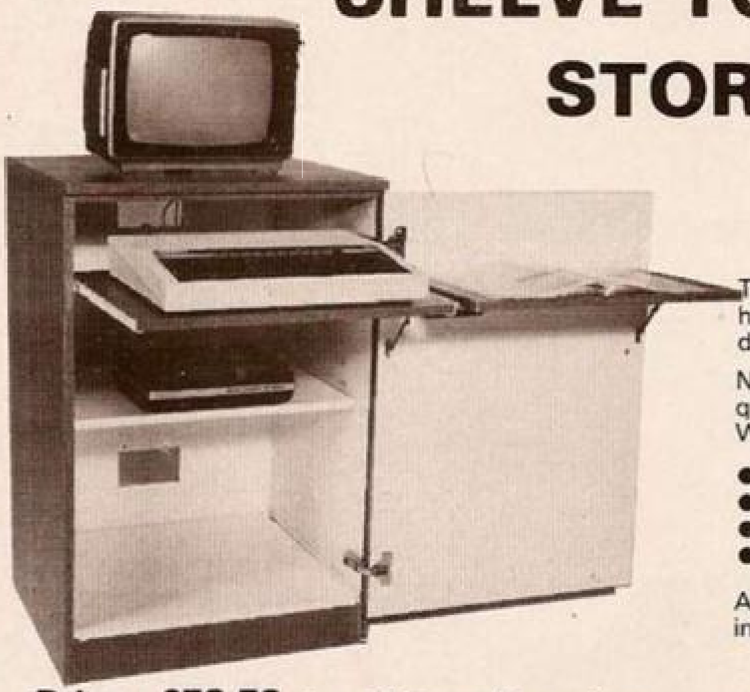
Mail to:

SOFTWARE EXPRESS
FREEPOST
(No Stamp Required)
Gores Road,
Kirkby Industrial Estate,
Kirkby, Liverpool
L33 7UA.

YC

SHELVE YOUR COMPUTER STORAGE PROBLEMS . . .

MICRO-STAK



The unique and sturdy Micro-Stak has been designed by micro users to house all your equipment ready for use, and also serve you as a work desk/station for your computer activities.

Not just a stand or a table, but an elegant piece of furniture, available in top quality, durable melamine, in oak or elm finish, measuirng only H.87cm × W.56cm × D.53cm when closed.

- Handy slide out bottom shelf for easy removal of VDU/monitor.
- Glide out keyboard shelf.
- Lift up writing/manual table on door.
- Adjustable height shelf for cassette player, disc drives, etc.

Available by mail-order. Send your order today, or contact us for more information. Personal callers welcome.

Price: £79.50 inc. VAT + £5 carriage
Flat packed for easy assembly

MICRO-STAK
(One of the Roy Hopwood group of companies)
10-12 OAK ST, HAZEL GROVE
STOCKPORT, CHESHIRE SK7 4EJ
061-483 8271
Allow 21 days for delivery

ORDER COUPON
Please supply one MICRO-STAK in .... wood finish my cheque for £84.50 is enclosed/debit my Access/Barclay Credit card. NO

NAME ....
SIGNATURE ....
ADDRESS ....
....



Bamby software

All new games:- for the Dragon 32.

Mini-games:— 4 per tape, simple but compelling!	£5.95
Surprise:— spells, giants, a magic ring, but this is no relation to the 'Lord of the Rings	£8.45
Amazing:— series of 5 mazes, written for children but interesting enough for everyone	£5.95
Stockmarket:— try and make a million in this realistic game	£5.95

For all these please ring:— 085-982-239 anytime between 9a.m. and 9p.m. or *write to:*

Bamby Software, Leverburgh, Isle of Harris. PA83 3TX.

A NEW SERIES FOR FIRST TIME USERS



"Learning to Use" is a new series of books which introduces newcomers to the most widely used micros in the marketplace.

The books assume absolutely no knowledge about computers and the reader is shown even the most fundamental operations such as "switching on" and "loading a program". The books lead the reader through simple programming and then on to graphics, with several programs which show how to achieve pictures and even animation!

The user-friendly approach is consistent throughout the text – not only are program listings clearly shown, but in many cases, a photograph is included to show what the program looks like when actually loaded and run!

All books in the series are £5.95 (incl. postage). **Gower**

To be published April–June 1983

Learning to Use the Apple II/IIE Computer (April)
Learning to Use the Oric 1 Computer (April)
Learning to Use the Commodore 64 Computer (May)
Learning to Use the TI 99/4a Computer (May)
Learning to Use the Lynx Computer (June)

READ-OUT

YC4B

Order Form to: **READ-OUT BOOKS AND SOFTWARE**
8 CAMP ROAD, FARNBOROUGH, HANTS, GU24 6EW.
24 Hour Answering Service. Telephone 0252 510331/2

Name ______________________

Address ______________________

Make cheques payable to Newtech Publishing Ltd — I enclose my cheque for £ ______

Please debit my Access ☐ — Signed ______

Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ — Date ______

NOW AVAILABLE
Please send me ....copy/ies all at £5.95 each
incl. postage & packing. (Allow 14 days for delivery.)

☐ Learning to Use the PET Computer
☐ Learning to Use the BBC Microcomputer
☐ Learning to Use the ZX Spectrum
☐ Learning to Use the VIC-20 Computer
☐ Learning to Use the ZX81 Computer
☐ Learning to Use the Dragon 32

To be published
Please reserve for me, and send to me on publication my copy/ies of all at £5.95 each (incl. post & packing)

☐ Learning to Use the Apple II / IIE
☐ Learning to Use the Oric 1
☐ Learning to Use the Commodore 64
☐ Learning to Use the TI 99/4a
☐ Learning to Use the Lynx

SOFTEK

48K ZX Spectrum
COMPILER

£14.95



Dragon's Lair and Joust

. . . just two of the six new amazing games from the masters.

Dragon's Lair

I thought it would be easy . . . explore the Dragon's Lair and find the Crystal of Power with which to destroy him. But I didn't count on the dangers that confronted me. There were others in that mind boggling maze too!

The Ultimate 3D Maze Adventure, for the 48K ZX Spectrum.

Joust

It's taken America by storm — now it's available for your ZX Spectrum! In this amazing new arcade game you Joust with the Dark Lords in an other-worldly setting. Quite amazing animation as you fly your Ostrich by controlling the flap of its wings! By Andrew "Orbiter" Glaster.

MONSTERS IN HELL

It was like a nightmare. Trapped in Hell, the all consuming flames below me, running from the Vampire monsters through a maze of platforms and ladders. I had Holy Power on my side, though, and could survive if I replenished it frequently. And the only way to kill them was to make them fall through holes I created with my hammer. But then the Mad Monk sent his ghouls after me . . . Any ZX Spectrum. By Mark Lewis.

MILLIPEDE

Milli the Millipede seemed indestructible; no matter how much of her body I shot away she kept coming! But then Sid the Spider appeared from nowhere, and Scorpi zoomed across dropping her indestructible fleas on me! A quite astounding version of the arcade favourite. £5.95. By Andrew Blake.

FIREBIRDS

They swoop, they dodge, they loop figures of eight! Can you survive the Firebirds' attack? Amazing hi-res machine code action from the Masters. Any ZX Spectrum. By Graham Devine.

COSMIC SWARM

OK, I accept I'm to blame. I disregarded orders and entered the Altair sector. Eggs, eggs, everywhere — I shoot, two fantastical alien types appear, whose touch is deadly! They join, seemingly by chance, into a mutant which chases me! Probably the most original new space "shoot em up" game to appear. Any ZX Spectrumn. By Andrew Beale.

ALSO AVAILABLE

And you can still obtain our outstanding Meteorids, still the best available, or our Zolan Adventure, still the only truly playable 16K Adventure!

EACH GAME JUST £5.95

including VAT, Postage and UNCONDITIONAL GUARANTEE. ALL GAMES IN 100% MACHINE CODE. Available from all good shops, or if they are out of stock, direct from us by return of post please make out your cheque/P.O. to Softek.

SOFTEK SOFTWARE, 329 CROXTED RD., LONDON SE24

WANTED, GOOD M/C PROGRAMMERS FOR SPECTRUM, BBC, DRAGON, VIC, ETC.

GENEROUS DEALER DISCOUNTS

THE
Midland Computer Fair

Personal computers
Home computing
Small business systems

BINGLEY HALL, BIRMINGHAM
28-30 APRIL 1983
Thurs & Fri 10am – 6pm
Saturday 10am – 5pm

Presented by YOUR COMPUTER Practical Computing

This event is the first of its kind in the Midlands, and gives you the opportunity to see and compare the enormous range of personal and home computers, small business systems, microcomputers, software packages, cassettes and scores of the very latest computer games – try them for yourself – decide how much, or how little it takes to build up your own personal computer system.

HOW TO GET THERE

BY RAIL Concessionary rail fares are available direct to New Street Station. Further details are available from, British Rail Travel Centre, New Street Station, Birmingham B2 2QA Tel: 021 643 2711.

BY BUS every few minutes from New Street, Corporation Street, Colmore Row and Bull Ring.

BY CAR Bingley Hall is situated close to the city centre and is within easy access to the M1, M5 and M6. Bingley Hall will be road signed by the AA.

Admission prices – Adults £2.00 Children under 16 and O.A.P's £1.00. Party Booking: For groups of over 20 people – adults £1.50 children 75p, (plus a free ticket per 20 sold for the organiser or teacher).

Please send . . . . .adult . . . . .child tickets Enclosed remittance £ . . . .
NAME . . . .
ADDRESS . . . .
. . . . **TELEPHONE NO** . . . .

Send to Midland Computer Fair Ticket Office, I.P.C. Exhibitions, Surrey House, Throwley Way, Sutton, Surrey
Tel: 01-643 8040



PCS

RETAILERS!
PERSONAL COMPUTER SERVICES THE BIGGEST COMPUTER SOFTWARE WHOLESALER IN GT. BRITAIN

WE OFFER *VERY* GENEROUS DISCOUNTS ON SOFTWARE INCLUDING THE FOLLOWING SUPPLIERS:—

PROGRAM POWER • BUG BYTE • SALAMANDER • TITAN • MIKRO-GEN • MICRO DEAL • MELBOURNE HOUSE • J K GREYE • KANSAS • ALGRAY • HEWSON • DK TRONICS • RABBIT

Save time and frustration. Get all your software needs from one company.

We have salesmen covering Scotland and the North of England who have what you need onboard their vehicles.

Until we have a sales team in other areas we can supply direct to you.

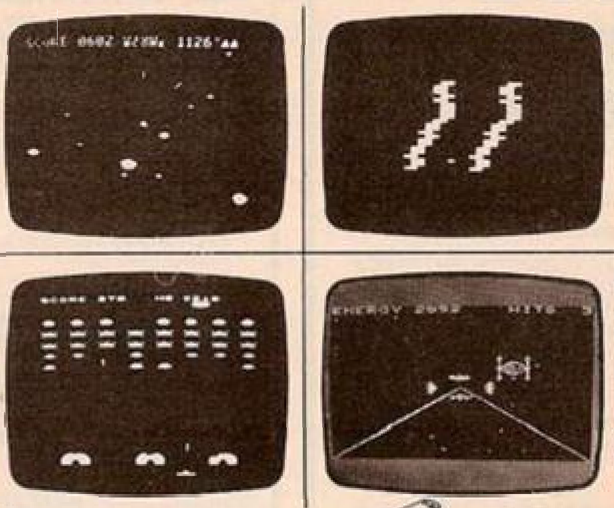
Ring now on: — 0254 776677 or wirte to:—

BRIAN GREENWOOD
WHOLESALE DEPT.
PERSONAL COMPUTER SERVICES
39 RAILWAY ROAD, DARWEN,
LANCS. BB3 2RJ

MR MICRO • ARTIC • LLAMASOFT • ROMIK • MARCOS • DIGITAL FANTASIA • J K GREYE ENTERPRISES • I J K • IMAGINE • A G F • QUICKSILVA • CALPAL

ARCADIA

ASTEROIDS, INVADERS, ASTRO SLED & SPACE FIGHTER.



ASTEROIDS

A classic version of the clasic game. Feature packed with thrust, hyperspace, rotate, multiple bolts, etc. This exciting program is written in m/c and employs hi-res graphics and double size screen techniques for maximum effect.

ASTRO SLED

Pilot your high powered sled down the jagged space canyon, but be warned - the further you travel, the harder it gets! With over 50 skill levels -

INVADERS

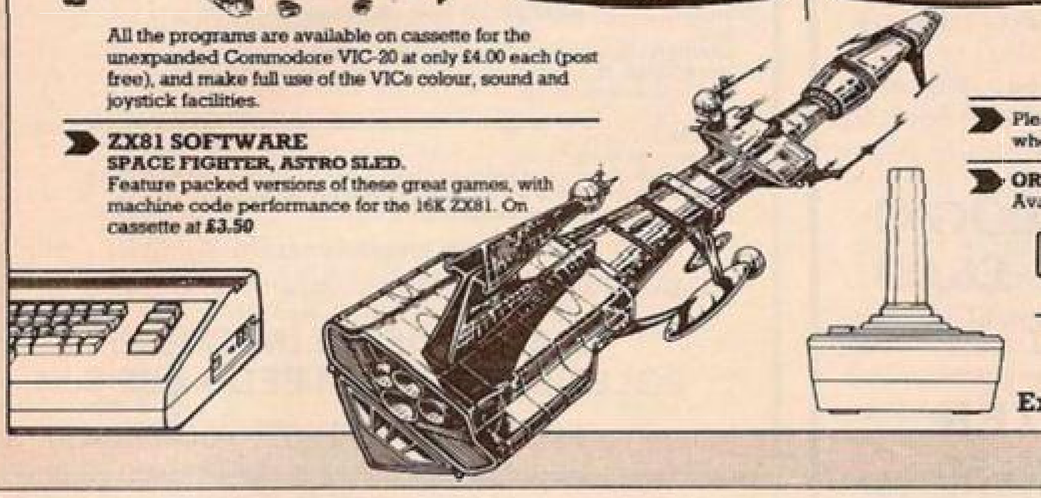
No machine is complete without this, the original cosmic shootout. In machine code with three invader types (plus mother ship), bonus bases, hi-res, double size screen, etc.

SPACE FIGHTER

A space dog-fight simulator which, like Asteroids, is written in machine code and uses hi res. Guide your fighter through tight loops and turns to centre the elusive alien craft in your sights. With 10 skill levels.

All the programs are available on cassette for the unexpanded Commodore VIC-20 at only £4.00 each (post free), and make full use of the VICs colour, sound and joystick facilities.

ZX81 SOFTWARE
SPACE FIGHTER, ASTRO SLED.
Feature packed versions of these great games, with machine code performance for the 16K ZX81. On cassette at **£3.50**



Please state **ZX81** or **VIC-20** and mention this magazine when ordering.

ORIC-1 SOFTWARE
Available now - send SAE for full details.

ARCADIA SOFTWARE

FREEPOST, SWANSEA, SA3 4ZZ
NO POSTAGE REQUIRED
Excellent dealer discounts available.

We teach you the secret language of tomorrow's world



These include: tennis, soccer, cricket, swimming, riding, fencing, canoeing, golf, shooting, judo, archery, gymnastics, fishing, sailing, wind surfing, the creative arts etc. All under the supervision of university-qualified directors, instructors and monitors. And uniquely-equipped public school or country mansion locations in the Lake District, Devon, Dorset and around London and Manchester. Camp Beaumont also run day camps for younger children (5-15 years) offering over thirty play-as-you-learn activities including computers, robotics, and psycho-bionics. **Write for comprehensive brochure to Camp Beaumont,**

Since you appreciate the impact computers are making on tomorrow's world, you'll appreciate the key role Camp Beaumont can play in your future.

Because Camp Beaumont's computer boffins using structured courses (basic, advanced and intensive) teach you the secret language that'll give you a head start in tomorrow's high-tech world.

But without tears. Because at Camp Beaumont (for 9-17 year olds) there are over thirty physically stimulating activities also available to help you escape from computer fatigue.

CAMP BEAUMONT

Dept. YC-1, Beaumont House, 73 Upper Richmond Road, London SW15 2SZ. Tel: 01-870 9866.

Brings out the computer in you.

EDUCATIONAL SOFTWARE

EXCLUSIVE TO GREENWELD
A range of programmes written by teachers and currently in use in a middle school (8-13yrs). All cassettes include comprehensive documentation and teachers notes. Exercises are user-friendly, very robust with all inputs checked, and include machine code routines.
12 titles are available for these computers:
ZX81 (16K); ZX SPECTRUM (16K); BBC 'A' or 'B'. All tapes for any machine are £4.95 each inclusive. Set of 12 £45.00

1. MASTERMIND. Try to find a 3 to 7 digit number the computer has selected in less than 10 attempts.
2. BAR CHARTS. Enter information on X & y axis, and see a bar graph drawn of your results.
3. OXO ANAGRAMS. Noughts and crosses game that requires the pupil to solve an anagram to gain a 'O' or 'X'.
4. HANGMAN. Traditional game with 10 categories and 10 words in each category. Different words/categories can easily be entered.
5. SPELL INVADERS. Shoot at the correct letter in the alphabet to spell the word shown on the screen for a few seconds. lose an 'invader' each time a wrong letter is selected!
6. REACTION TEST. To promote keyboard familiarity give practice in reading decimal numbers.
7. DEPTH CHARGE. Practice in the use of ordered triple (X, Y, Z) coordinates in 3 D. Also covers the points of the compass.
8. ZIGOL. practice in the use of ordered pair (X,Y) coordinates in 2D.
9. GUILLOTINE. French version of hangman, but your head drops into a basket if you fail to find the word!
10. OXO ADDITION & SUBTRACTION. Noughts and crosses game where the pupil solves an addition or subtraction sum to gain a 'X' or 'O'.
11. OXO MULTIPLICATION & DIVISION. As above but using times and divide.
12. BEETLE ADD. To get the various parts of the beetle, simple addtion sums must be solved.

Large range of games, utility and educational programs at our shop in Southampton, and also in Salisbury at Electronics World, Dews Rd, Salisbury.
A list is available for each make of computer, which contains details of software and books

BLANK TAPES
High quality C15 tapes in library case 50p. 10+ 45P each

We stock a large range of electronic components; our 60 page A4 size catalogue contains discount vouchers and costs 75p. (Sent free to schools, colleges etc) Discount up to 50% available to bulk buyers.

TRADE ENQUIRES welcome for either software or components.

TERMS: Cash with Order please. Most goods sent by return of post. Official Orders from Schools etc welcome — minimum invoice value £10.00.

GREENWELD

443P Millbrook Road Southampton SO1 0HX

CAMBRIDGE LEARNING
SELF-INSTRUCTION COURSES



GSC SUPERKIT £19.90

Learn the wonders of digital electronics!

This practical kit for beginners comes complete with an instruction manual, components, and EXP300 breadboard to teach you all the basics of digital electronics. The course needs no soldering iron; the only extra you need to buy is a 4½V battery.

Using the same board you can construct literally millions of different circuits.

The course teaches boolean logic, gating, R-S and J-K flipflops, shift registers, ripple counters, and half-adders.

It is supported by our theory courses

DIGITAL COMPUTER LOGIC & ELECTRONICS £6.00

which covers: basic computer logic; logical circuit elements; the design of circuits to carry out logical functions; flipflops and registers; and

DIGITAL COMPUTER DESIGN £8.50

Our latest, most up-to-date course on the design of digital computers, both from their individual logic elements and from integrated circuits. You are first shown the way in which simple logic circuits operate and then, through a series of exercises, arrive at a design for a working machine.

SPECIAL OFFER! All orders received before 25th December will be sent by 1st Class post at no extra charge.

GUARANTEE No risk to you. If you are not completely satisfied, your money will be refunded upon return of the item in good condition within 28 days of receipt.

CAMBRIDGE LEARNING LIMITED, UNIT 82 RIVERMILL SITE, FREEPOST, ST IVES, CAMBS, PE17 4BR, ENGLAND.
TELEPHONE: ST IVES (0480) 67446. VAT No 313026022

All prices include worldwide postage (airmail is extra – please ask for prepayment invoice). Giro A/c No 2789159. Please allow 28 days for delivery in UK.

......SUPERKIT(S) @ £19.90
......DIGITAL COMPUTER DESIGN(S) @ £8.50
......DIGITAL COMPUTER LOGIC AND ELECTRONICS @ £6.00

I enclose a *cheque/PO payable to Cambridge Learning Ltd for £......... (*delete where applicable)

Please charge my:

*Access / American Express / Barclaycard / Diners Club Eurocard / Visa / Mastercharge / Trustcard

Expiry Date........... Credit Card No ....

Signature...

Telephone orders from card holders accepted on 0480 67446

Overseas customers (including Eire) should send a bank draft in sterling drawn on a London bank, or quote credit card number.

Name...

Address..

....

GSCUnit81

Cambridge Learning Limited, UNIT 82 Rivermill Site, FREEPOST, St Ives, Huntingdon, Cambs, PE17 4BR, England. (Registered in England No 1328762).

YC3

DRAGON SOFTWARE
from J. Morrison (Micros)

EDITOR/ASSEMBLER + MONITOR
Assembler functions include ORG, FCB, FDB, FCC, EQU, RMB and hex or Decimal addition/subtraction, The ASSEMBLER is of the Two pass Global type. Monitor contains useful routines enabling the user to write and run machine code programs. Supplied on cassette + user manual £27.65

D.G.T.1
Contains five super games. OTHELLO, BREAKOUT, AWARI, MOONLANDER and RAFFLES.
Fascinating entertainment for all the family. Only £5.75

D.G.T.4 M/code.
PTERODACTYL. Destroy all the Eggs before they hatch. Beat off the attacking PTERODACTYLS.
TORPEDO RUN. Similar to the ARCADE version. 3D perspective. Ships further away give higher points.
HORNETS. Very fast game. Kill the HORNETS as they emerge, but beware when angy they swwop down firing 'stings'. All three games only £6.95

DISASSEMBLER
The ideal tool to have around. Disassemble the BASIC to see how it works. Make use of subroutines, etc.
Supplied on cassette £11.85

D.G.T.2
M/Code games. **SNAKES.** Kill them before they kill you. Up to 12 giant snakes at one time.
LANDER. Land your craft on the Lunar surface.
INVADERS. 35 Invaders, mother ship, 3 defenders, 9 skill levels. All three games in HI-RES + sound £6.95

CHESS M/Code.
8 Selectable levels of play.
HI-Resolution display of board and pieces. Cursor control 'move' selection. specific pieces may be set up to solve chess problems.
Supplied on cassette + instructions. £7.95

NO JOYSTICKS NEEDED

All orders inclusive. Return of post service. Cheque/PO to:

J. MORRISON (MICROS)
2GLENSDALE ST. LEEDS LS9 9JJ.

CALLERS WELCOME PLEASE RING (0532) 480987

Buy from us with confidence
Full money-back guarantee on all our products

"Thank you once again for your prompt service; yours must be the most user-friendly company in the business!" G.S. Yorks

"I must congratulate you not only on the quality of your goods but also on your excellent service." G.W. Solihull

Quality software
ZX 81 Spectrum BBC Vic-20

GAMES CASSETTES

ZX81 (16K) SUPER INVADERS £4.95
On-screen league tables, animated instructions. Game in machine code – "excellent ... one of the two best ... deservedly popular" (Pop. Comp. Weekly) "Great game!" S.F. Glos.

ZX81 (16K) LYNCHMOB £4.95
Exciting word game. 2-6 players. Excellent for the family. Great fun, educational tool Animation, on-screen scoring.

Spectrum (16K) LYNCHMOB £6.50
As for ZX81 but with added excitement of colour, sound and hi-res animation.

VIC-20 (unexpanded) INVADERS £6.90
Machine code, colour, eight sound effects

BBC ("B") BRIDGEMAN £7.90
The popular gobbler game. Hi-res, colour, sound.

APPLICATIONS SOFTWARE on cassette

ZX81 (1K) GRAPHICS STARTER PACK £4.50
Four 1K Graphics programs on cassette with 12 pp. explanatory manual.

ZX81 (16K) MULTIGRAPHICS £6.90
A user-friendly package of procedures giving you full control of the ZX81 graphics functions to compose designs, drawings, adverts etc. Incorporates advanced sketchpad, 3 sizes of text (including lower case), animation, printer output. SAVE displays etc. Businessmen use it to advertise at point-of-sale. 20 pp Manual.

Spectrum (48K) SPECTROGRAPHICS .... Send s.a.e. for details
Another superb user-friendly graphics program — hi-res and lo-res sketchpads, multisize text, etc. etc.

ZX81 1K STATISTICS £4.00
Mean, SD, variance, correlation, regression, t and F tests. 8 pp Manual includes listings, test data etc.

Spectrum (48K) STATISTICS (price includes maintenance) £9.90
Mean, SD, variance, correlation, regression, t tests. Hi-res graphic displays, data manipulation procedures.

EPHEMERIS ZX81 (16K) .... £6.90 **Spectrum (16K, 48K)** £7.90
Interested in heavenly bodies? Input date, time and your position, Ephemeris computes altitude, azimuth, phase etc. etc. for sun, moon and planets.

16K RAM pack Memotech Memopak 16 **£28.50**

Send s.a.e. for details of our products
All-inclusive prices. First Class return-of-post mail in U.K.
European customers add 30p per item, 70p Worldwide (Air Mail)
Available by mail order or from leading computer stores. Trade enquiries welcome.

Dept. YC, 36 Fernwood, Marple Bridge, STOCKPORT, Cheshire SK6 5BE, ENGLAND.

Bridge Software

SOFTEK

SOFSYS

The first true system for the ZX Spectrum

Sofsys is the only true software system for the ZX Spectrum. At the heart of it is 'Master Key' which offers User Definable Keys, and it includes our highly successful BASIC Compiler (Sofcom), Sofmon (our Disassembler), Sofsem (our Assembler), Sofkits 1 and 2 (our toolkit and graphics packages).

MASTER KEY

This superb program is the heart of Sofsys, and may of course be used independently of it too. It offers up to 7 user definable keys which are accessed by allowing the SPACE key to act as an additional shift key. Up to 100 bytes of BASIC can be put on each key, and 5 of them come pre-defined so that instant access to one of our utilities is possible, or instant compilation of a program. Master Key also includes Softime, a new version of our popular realtime digital clock program. This runs independently of your program and can be used to time events, has a stop watch mode, alarm facility and which can be set for 12 or 24 hour modes. Master Key comes with 4 versions on a cassette, three 48K versions set in different memory locations (depending what else you have of our system in memory) and a 16K version. Master Key even offers ON ERROR and ON BREAK definition too! A fabulous program for only £7.99.

SOFKIT 1

Our 'programmers dream' toolkit, dubbed so by us for the immense saving it can allow when developing programs. It has all the features you could ever wish for in a toolkit: a complete RENUMBER (GOTO, GOSUB, RESTORE, LINE), DELETE lines or blocks of program, SEARCH for any character/number/keyword, REPLACE anything with anything else of the same number of bytes, UPPER/LOWER CASE conversion (either way), FREE MEMORY displayed, PROGRAM LENGTH, VARIABLE SPACE used, DISPLAY VARIABLES (which used and what present values), ERASE all REM statements, and the first ever implementation of TRACE on a ZX Computer. This displays the present line number/statement being exectued in the top right-hand corner of the screen. A truely unbeatable toolkit at £7.99 and incredibly user friendly. All commands accessed by a single letter after a REM and Master Key save you typing in the REM each time!

SOFMON

Sofmon has around 25 features and functions which make it the most complete monitor/disassembler on the market. It can convert HEX to DEC and vice versa, search for a series of bytes, fill and area of RAM with a given value of HEX, display the registers, do ASCII or HEX dumps of memory, execute a routine; gives the choice of using a printer, allows up to 9 (yes 9) breakpoints which you can continue from, set/reset individually, etc. Of course Sofmon disassembles too, and does this better than any other on the market. If a disassembly is nonsensical it will tell you so, it will handle every known Z80 op code. Finally, you can modify RAM in either HEX or ASCII (and switch back and forth). Uniquely, Sofmon actually disassembles the HEX as it is entered! Superb value at only £7.99 and of course you can enter Sofmon at a single key press with Master Key. Fully compatible with our Sofsem assembler.

SOFSEM

A truely amazing assembler which is totally machine code; enter op codes in line numbers, renumber them if necessary, edit lines, use pre-defined labels or create your own, have a second stack (a unique feature) and Sofsem has a 42 column display to allow full lines of information and labels. Option to insert an end-of-line character for printers, option to switch to a 32 column display. Once again, unbeatable at £8.99, and of course can be entered at a single key-press with Master Key. Designed to be compatible with Sofmon for a complete machine-code programming package.

SOFCOM

Our BASIC Compiler for the 48K Spectrum which has now been brought by many thousands of happy Spectrum users as well as government establishments here and abroad and many Universities, Polytechnics, etc. This program almost instantly converts almost any Spectrum BASIC program into a machine code version. The enhancement package will be available very soon to offer full floating-point handling, strings/arrays and allow the compilation of very large programs. You can expect an increase of typically 10 times in speed over BASIC, but up to 500 times faster is possible in some cases. This is still the only Compiler worth considering for the Spectrum and comes with entensive manual by Tim Langdell and in a book-size box. Excellent value at £14.95. Compile a program at a single key-press with Master Key!

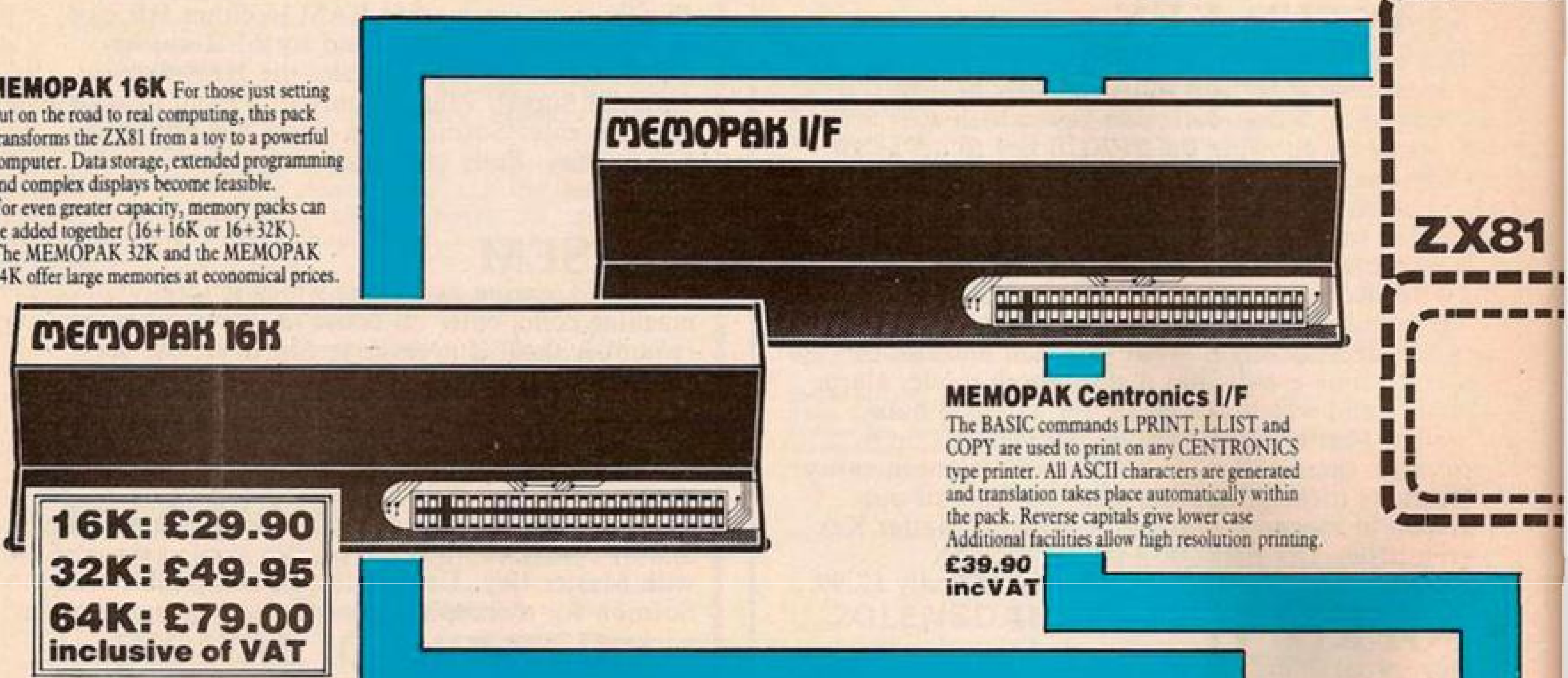
SOFKIT 2

The total graphics enhancement package for the Spectrum. All the features you could wish for in such a package, such as scrolling in any direction by pixel or bytes, create windows to scroll independently, flash the screen, invert it, magnify letters/phrases/characters, create sound effects, store extra screens in memory, load screens and parts of screens super fast to create cartoon effects, and more. Undoubtably the best graphics kit on the market at only £7.99 (16K and 48K versions on tape). Includes the first ever PAINT facility for the Spectrum!

SOFTEK SOFTWARE
329 Croxted Road, London SE24

At Men[...]
we realise the poten[...]

MEMOPAK 16K For those just setting out on the road to real computing, this pack transforms the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays become feasible.
For even greater capacity, memory packs can be added together (16+16K or 16+32K).
The MEMOPAK 32K and the MEMOPAK 64K offer large memories at economical prices.



16K: £29.90
32K: £49.95
64K: £79.00
inclusive of VAT

MEMOPAK Centronics I/F
The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case
Additional facilities allow high resolution printing.
£39.90 incVAT

It all adds up to an efficient, modular computer system

The **Memotech** approach to microcomputing is to take the well-proven and popular ZX81 as the heart of a modular system. This small computer houses the powerful Z80A processing unit and acts as the central processor module through which the **Memopaks** operate.

Memotech has a reputation for professional quality, producing units which are designed to fit perfectly, to look well-balanced, and to work efficiently and reliably.

The modular approach gives ZX81 owners the freedom to design the system they really need. Furthermore, the intercompatibility of the modules ensures that later additions will click straight in, to give you a system that grows with your ambitions and abilities.

To ensure that your expectations are realised, care is taken at every stage to design features into the system to anticipate your needs. For example:
1) Memories are cumulative e.g. 16K and 32K can be added to the **Memopak 16K** or even to the Sinclair 16K RAM pac[...] 2) The **HRG** firmware allows commonly used constructions (such as scrolling, shading and labelling graphs), to be calle[...] by a few simple commands. 3) The **Centronics I/F** converts ZX81 character codes into ASCII and extends the print line[...] the width of the printer, still using the LLIST, LPRINT an[...] COPY commands.

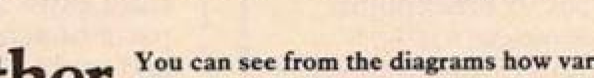
As one example, a system with 16K of memory and **Memocalc** is all that is required to perform the same sophisticated numerical projections as a computer at 10 time[...] the price. The problem may be as complicated as a cash flow or production schedule, or as simple as household accounts [...] pocket money budgeting. If your bank manager wants to see cash flow, then a single print instruction to the **Centronics I**[...] will give a printout which is more than acceptable.

The example system which is shown, on the other hand would satisfy the needs of someone who wanted to enter dat[...]

How it all fits together

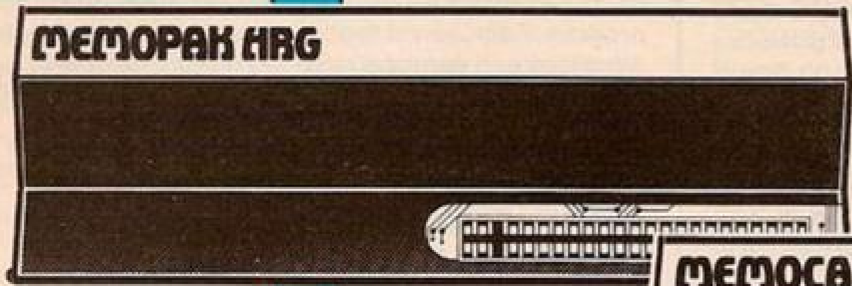
You can see from the diagrams how various Memotech/Sinclair units can be combined.







otech,
tial of your ZX81...

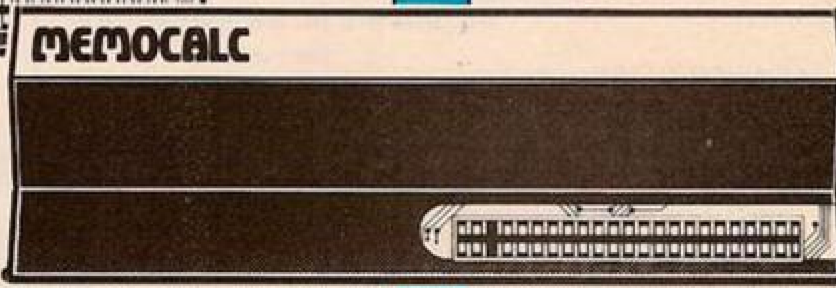


MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.

£39.90 inc VAT

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number.

£29.90 inc VAT



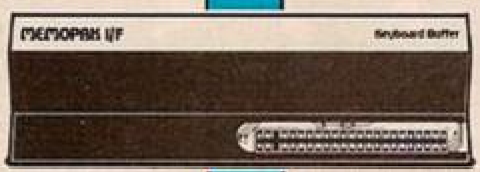


MEMOTECH KEYBOARD

The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.

£49.95 inc VAT





KEYBOARD BUFFER PAK
The Buffer Pak performs a "housekeeping" function for the Keyboard, interfacing directly with the port at the back of your ZX81.

via a light-touch keyboard, construct and label graphs, and then copy the screen to an 80-column printer. Only 16K of memory is shown here but with additional memory, more than one video page can be stored. Up to 7 pages can be displayed in rapid succession to give animated displays.

Looking forward, **Memotech** will continue to back the ZX81 through 1983 with fast storage devices, pressure sensitive electronic drawing boards and more software packs including a **Wordprocessor**, an **RS232 Interface** and a **Z80 Assembler.**

MEMOTECH products are available from major branches of W.H. SMITH'S & JOHN MENZIES

To: Memotech Limited, Witney, Oxon, OX8 6BX
Tel: Witney 2977, Telex 83372 Memtec G
Please send me the following Memotech products:

Please add £2.00 per item to cover post and packing

I enclose a cheque/P.O. for ________
or please debit my Access/Barclaycard account number

Signature ____________________ Date ______

Name and Address ____________________

TASWORD THE WORD PROCESSOR

48K SPECTRUM

"Very good value and great fun to use."
"Unreservedly recommended."
Popular Computing Weekly 19/8/82 – ZX81 Tasword

Now your Spectrum becomes a word processor with TASWORD. All the features of the ZX81 Tasword plus many extras. Designed to fully utilise the capacity and capabilities of your 48K Spectrum. More than 6K of machine code, a Basic program, and a manual, to give you a usable and powerful package.

Use TASWORD to produce your letters, essays, papers, records, lists, and for almost any task that requires the written word.

Whether you have serious applications or simply want to learn about word processing, TASWORD makes it easy and enjoyable.

TASWORD TUTOR
"an eloquent demonstration of Tasword's uses"
We send you a manual and a cassette. The cassette contains TASWORD and TASWORD TUTOR. This teaches you word processing using TASWORD.

£7.95 fully inclusive mail order price.

£1 DEMONSTRATION CASSETTE

See for yourself what TASWORD can do. Send just £1 for a demonstration cassette. This cassette contains the TASWORD program (with some facilities inhibited) and a text file which describes and demonstrates the performance and features of TASWORD. A voucher is included which gives you 50p off the price of Tasword.

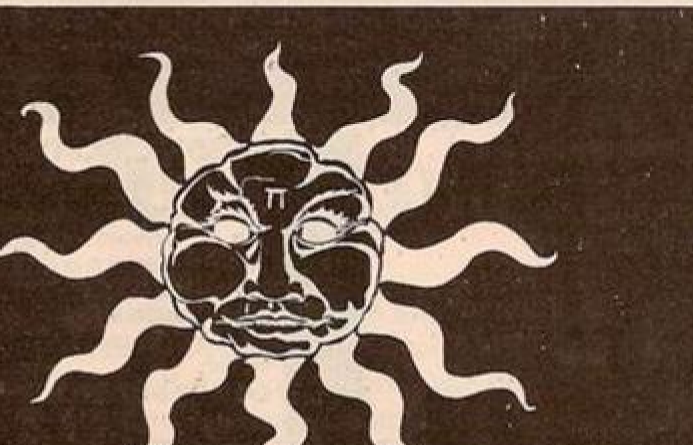
TASMAN SOFTWARE

Dept. YC

17 HARTLEY CRESCENT LEEDS LS6 2LL

ZX81 TASWORD

Tasword for the ZX81 (16K) is still available at £6·50. No demonstration cassette available but send 50p (refundable against your subsequent purchase of ZX81 Tasword) for a copy of the manual.



PIMANIA

THE ADVENTURE GAME THAT'S FOR REAL ! £6,000 PRIZE!

Will you be the first to locate the Golden Sundial of Pi in time and space, and be rewarded with the original? Exquisitely crafted by the winner of the De Beers Diamond International Award, from gold, diamond and the most precious of the earth's riches.

PIMANIA – where saxophones turn into hangliders, where music meets madness and where the Pi Man rules supreme! He'll talk with you, he'll befriend you, he'll betray you, he'll even do the Hokey Kokey! Animated cartoon graphics! Full musical score! Spectacular colour and sound effects!' Includes free hit single "Pimania", with vocals by Clair Sinclive and the Pi-Men!

It could take you a week to play, it could take you a lifetime! PIMANIA, "... the best evidence that computer gaming has come of age ... an adventure enthusiast's dream!" (Computer & Video Games)

48K SPECTRUM*	£10
16K ZX81	£5
DRAGON 32*	£10
BBC Model B*	£10

AUTOMATA Ltd.
65a Osborne Road
Portsmouth PO5 3LR
England

New Generation Software

From M. E. Evans the author of the highly acclaimed 3D MONSTER MAZE and 3D DEFENDER



3D TUNNEL (16K & 48K Versions on one tape)
What lies in the depths of the tunnel? Flapping bats, leaping toads, scurrying rats, crawling spiders, all appear live in the 3D TUNNEL as it weaves about. We leave the last object to your imagination. (Not in 16K version). Price £5.95, special introductory offer at £4.95 until February 28th.

TWO 3D GAMES FOR THE SPECTRUM



ESCAPE (requires only 16K)
Can you eascape from the dinosaur infested maze? 3D grandstand view provides dinosaurs with the opportunity to hide behind the hedges or to soar over them to swoop down on you. "One of the best and most original games we have seen for the Spectrum so far". SINCLAIR USER. Price £4.95

For instant CREDIT CARD Sales by phone only ring 01-930-9232

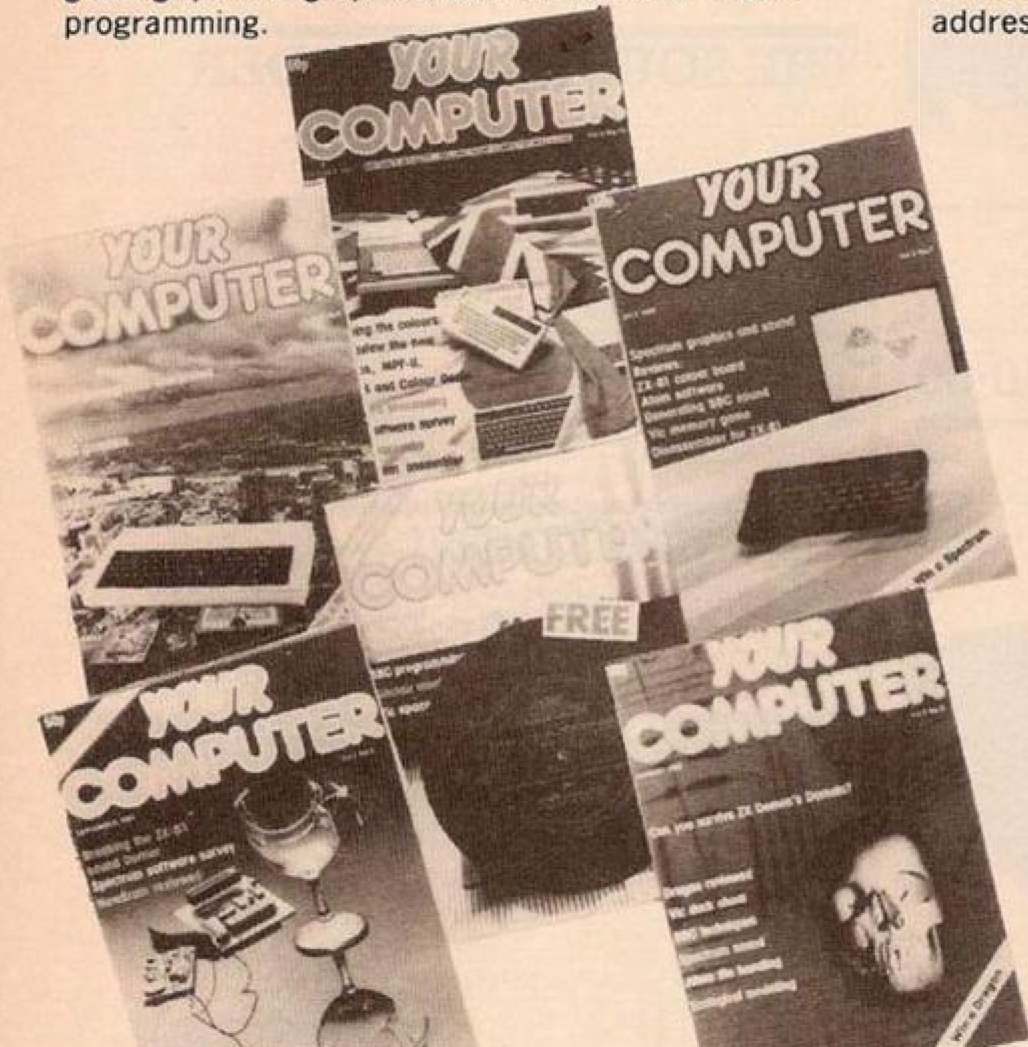
Orders to: NEW GENERATION SOFTWARE dept YC
FREEPOST (BS 3433) (no stamp required in UK)
OLDLAND COMMON, BRISTOL BS15 6BR

Please send s.a.e. with all enquires and for lists of stockists. TRADE ENQUIRIES WELCOME AT ADDRESS ABOVE.

YOUR COMPUTER BACK ISSUES

Just getting started in computing? Or perhaps you're already pretty knowledgeable and would like to extend your programming skills. Either way Your Computer back issues can help to fill your need for reliable and, above all, relevant information about home computing.

Every issue contains reviews of new computers, software evaluations, and surveys of add-on equipment together with informative articles which tell you how to get to grips with graphics, sound and machine code programming.



To obtain any of these back issues please complete and return the coupon printed below. Prices per copy including post and packing are: United Kingdom: £1.50. Europe: £2.00. Rest of world: £2.50 (by Air Mail)

Facilities provided on the Sinclair ZX81 and Spectrum, Vic 20, Acorn Atom and BBC micro have been examined in article after article, providing a comprehensive introduction to all the most popular home computers. Just run your eye down the Contents of our back issues and you'll see what we mean.

To order back issues complete the coupon at the foot of this page and send it with your remittance to the address shown on the coupon.

January 1982
Reviews: BBC micro; Wordprocessing on Atom; Morphy v. Champion (chess computers). Game — Treasure House. Education — ZX81 programs for school use. Vic-20 Software. ZX81 Graphics. A-D conversion. Interview — Kenneth Baker.

May 1982
Survey: ZX Software. How to write a chess program. Games — Vic 20 Tank Battle; Magic Squares. How to show off your ZX81. Joysticks for the ZX81. BBC Graphics. How to write a word processing package. Interview — Richard Turner.

June 1982
Reviews: Sinclair Spectrum; Vic 20 Software; ZX-81 Keyboards. Games Vic 20 Mars; Othello on Flexidisc. Atom Utilities. ZX81 machine code monitor. How to build a portable computer. Interview — Ron Bissell.

July 1982
Survey: Atom Software. Spectrum Graphics. ZX-81 Colour Board. Games — Dog Race; Genie Guessing Game; Simon Challenge. BBC Sound. ZX-81 Dis-assembler. Programs for ZX-80. Interview — Richard Altwasser.

August 1982
Review: Dragon 32. Survey: Vic memory expansion. Spectrum Sound Games — Demon's Domain; Vic Duck Shoot. ZX-81 machine code (Part 1). Atom file handling. Ecological modelling. BBC techniques. Interview — Tony Baden.

September 1982
Review: NewBrain. Spectrum Software. Sound on ZX-81. Games — Vic Dambuster; B-52 Bomb Run. Vic-20 Assembler. Spectrum Disassembler. ZX-81 Indexer. ZX-81 machine code (Part 2). Midwich MC control computer. Interview — Hermann Hauser.

October 1982
Reviews: Sanyo PHC range; MPF-II; Commodore 64; Colour Genie. Survey: BBC Software. Atom Forth. Pascal for Basic users. ZX word processing. Games — ZX-81 Pinball; Vic Catacombs. Atom text. BBC control Key. Spectrum Assembler. ZX-81 machine code (Part 3). Interview — Douglas Adams.

November 1982
Reviews: Jupiter Ace, Low cost Printers. Survey: ZX81 Software. Atom, BBC & Spectrum Sound. 3D Graphics for Dragon, BBC & Spectrum. Vic Night Racer. Dragon Artist. Interview — Clive Sinclair.

December 1982
Reviews: Sord M5 & MPFI. Vic Software. Games Special: Spectrum Flight Simulator, Atari Chicken, Sharp Coup d'Etat, ZX81 Probe, Vic Breakout, BBC Maze Muncher, Atom Quest. Survey: Vic Software, ZX81 Chess, BBC Music, ZX81 Forth, Atom Accounts.

Issue (month)	Year	Quantity required

To: General Sales Dept., Room 108, Business Press International Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Please send me the back issues detailed left – for which I enclose cheque/PO for £ .... payable to IPC Business Press.

Name ....

Address ....

....

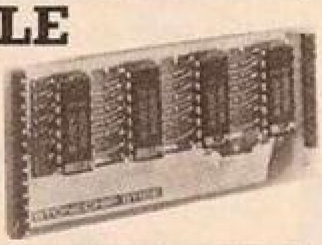
SPECTRUM AND ZX81 HARDWARE



PANDA

The famous Panda Expandable Ram Pack. Massive 16K add-on memory which can easily be expanded to 32K with an optional plug-in module. Supplied in rugged no-wobble design, rugged, injection moulded case, contoured to fit the ZX81 snuggly. Compatible with other add-ons (printer etc). LED on/off indicator. No additional power needed just plug in an go. British designed and made from top quality components throughout, guaranteed 12 months. **ONLY £24·50**

EXPANSION MODULE



The 16K 'Panda' is easily expanded from 16K to 32K by adding this expansion module as and when you need it.

ONLY £20·00

GIANT PANDA

Giant Panda the two together. Buy the Panda and the Expansion Module at the same time for a gigantic 32K bytes and save.
Complete at a special price of **ONLY £40·00**

PROFESSIONAL CASED KEYBOARD TYPE FD42



FOR ZX81 OR SPECTRUM

This famous, best selling product immediately converts your ZX Computer into a sturdy, attractive and professional unit, with full size typewriter keyboard. A tough plastic case encloses the keyboard, PCB and power supply. It has 42 keys including all the ZX81/Spectrum graphic characters printed on them. The full travel key switches have gold plated contacts and guaranteed life of 10^6 operations. It's so easy to install! You simply unscrew the ZX PCB from its case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required. **ONLY £29·00**

TYPE FDS FOR ZX81 OR SPECTRUM

Our new advanced keyboard has the same, fine specifications as the FD42 system, but with a new re-designed case, space bar and double-sized shift and enter keys. A must for the discerning ZX81 or Spectrum user. **ONLY £39·95**

ZX KLIK – KEYBOARD



If, like many ZX81 users, you are fed up with the dead feel of the touch sensitive keypad then consider the well tried 'Klik-Keyboard'. This is a simply fitted genuine push button keyboard which has been designed as an exact replacement for, and is no larger than, the existing keypad. ■ Fits on to the ZX81. ■ Full 40 keys plus one spare for any purpose. ■ No soldering – just plug in. ■ No trailing wires. ■ Clear permanent two colour legends. ■ Positive feel and sound as data is entered. ■ Speeds up programming enormously and reduces errors. ■ Fitting service offered £2·00 extra (remember to send your ZX81).

THE SOUND EXPANDER

A superb economical addition to your ZX Spectrum. Clear, dynamic sound effects will really enhance your enjoyment of the new exciting programs available for the Spectrum. Our new sound amplifier comes complete with leads, volume control and built-in loudspeaker. Simply plug into the mic input, it fits neatly on to the back of the Spectrum. **ONLY £7·50**

STOP PRESS

16K Spectrum owners – upgrade to 48K with a Spectrum Upgrade Pack complete with full instructions. No soldering. **ONLY £35·00**

COMING SOON!

Our range of products is constantly under development and review. We have selected products from leading manufacturers in the UK and believe these represent the best value and quality combination on the market today.

PRODUCTS ARE STOCKED AND USUALLY DESPATCHED WITHIN 10 DAYS.

I wish to order the following:

Quantity	Item	Amount
	Panda @ £24·50 inc.	
	Expansion Module @ £20·00 inc.	
	Giant Panda @ £40·00 inc.	
	FD 42 Keyboard ZX/Spectrum* @ £29·00 inc.	
	FDS Keyboard ZX/Spectrum* @ £39·95 inc.	
	ZX Klik-Keyboard @ £26·50 inc.	
	Sound Expander @ £7·50 inc.	
	Spectrum Upgrade Pack @ £35·00 inc.	
	TOTAL	

All prices include VAT and post and packaging. All items include a full year guarantee. Cheques/Postal Orders etc. should be made payable to: AFDEC Electronics Ltd.

Name ____________________

Address ____________________

Overseas customers add £4 post and packing YC4

AFDEC ELECTRONICS LTD 318 Kempshott Lane Basingstoke Hants RG22 5LT

YOUR COMPUTER CLASSIFIED 01-661 3036

Britain's Biggest Selling Home Computer Magazine

ATTENTION DRAGON AND SPECTRUM OWNERS

SMASH
DRAGON 32 £7.00/$11.75
A super "break-out" type game in high resolution graphics. Features include a demonstration mode and walls of increasing difficulty from a single wall up to a full three walls. Continuous display of score, best score and balls remaining.
FRUITA
DRAGON 32 AND
SPECTRUM 48K £6.50/$11.00
A deluxe fruit machine featuring:— 4 drums, Spin, Respin, Hold, Gamble, Collect, Nudge, Bounce, Blind, Cancel and Jackpot. New drums manufactured for each game.
EVICTOR TM
DRAGON 32 £18.00/$30.00
SPECTRUM 48K £5.50/$9.50
A reactive game with machine code for extra zip. Evict the aliens from their self-regenerating and defended base. Features lasers, phasor and bombs. 5 skill levels.
Special offer:—
DRAGON 32 — all three for £18.00/$30.00
SPECTRUM 48K — both for £10.50/$18.50
All prices inclusive, mail order only, cheques or postal orders to:—
WIZARD SOFTWARE, P.O. Box 23, DUNFERMLINE, Fife, KY11 5RW.
Send S.A.E. for full program catalogue. Royalties and/or commission paid for superior quality DRAGON or SPECTRUM software.
14/2

BBC Micro A/B Users. Operate your own Teletext compatible information service of up to 9/25 on-line pages with real-time date and clock. Ideal for shops, offices, public institutions, educational establishments etc. The Viewtext package comprises two interactive programs for page creation and display, comprehensive user guide and demonstration pages. Cheques/POs for £9.95 or SAE for details to IT Services, 27 Waterford Park, Radstock, Avon, BA3 3TS.
45/3

Spectrum Tape Header Reader. (16/48K) reads the information hidden in the header, eg code block addresses, lengths, start lines, etc. Cassette £2.95 + 55p p&p. W. Burns, 36 Luccombe Road, Upper Shirley, Southampton.
33/3

ZX81 16K

FANTASTIC VOYAGE: Real-time simulation by a lecturer in Anatomy. Search the blood vessels & destroy the clot — then get out again — safely!! £5.95.
STARTREK: Good presentation — Galactic Map, L-R Scan, S-R Scan, Fire Phasers, Fire Photon Torpedoes, Boost Shields. A really good version — £5.95.

UK101 (8K, 16 × 48)

FANTASTIC VOYAGE, LUNAR LANDER, 3D MAZE, X-WING FIGHTER, STARTREK, £5.00 Each.
Please state monitor (now WEMON).

From: K A SPENCER, 74 Dovers Park, Bathford, Nr. Bath, Avon
12/3

Chess Partner 2000 Chess Computer with Sensory board. 8 Levels of play. Used twice only. £50 no offers. Goss, 93 Stephens Firs, Mortimer, Reading RG7 3XA.
32/3

Acorn Atom 12K with Joystick and £60 Software and books. Bargain at £165. Luton 660678.
20/3

MONSTER SOFTWARE CLUB
Software library for the DRAGON 32
Top quality cassettes FOR HIRE
All tapes used with the Manufacturer's permission
SAE for details
Monster Software Club
32 Lennox Drive, Lupset Park Wakefield, West Yorks.
56/2

ORIC-1 OWNERS Tangerine created Oric-1 now TUG creates the rest. An independent Users Group with a solid reputation for progressive system support. Monthly Newsletters, Software, Hardware, Reviews, Advice, and lots more. We have a proven record of performance on our system. Join TUG. You'll like us, we do! Send £1.00 + S.A.E. (A4) for sample newsletter and details. Tangerine Users Group, 1 Marlborough Drive, Worle, Avon, BS22 0DQ.
56/3

Vic 20 owners. Exciting educational programs. Suitable for children aged 6-12 years. £5.00 plus 50p P&P. Send for details E.C.P. 99 High Street, hail Weston, St. Neots, Cambs.
6/2

PROM SERVICES

Permanent software for ZX micros

ZX81	
8K EPROM board + EPROM 1 or 2	£20
EPROM 1 40 toolkit routines	£10
EPROM 2 rapid SAVE/LOAD	£10
*EPROM 4 20 routine M/C monitor	£10
EPROM 5 Z80 disassembler	£10
Expansion Board — 3 slot	£15
Graphics Board — inc. 4K EPROM	£24.50
SPECTRUM	
EPROM BOARD	£19
16K RAMPACK adaptor	£6.50
32 line I/O board (also fits ZX81)	£16
Edge connector 23 or 28 way	£2.50
Edge cord 23 or 28 way	75p
*Tape version — special price	£5

Many other ZX products. SAE for list.
EPROM SERVICES
3 Wedgewood Drive, Leeds LS8 1EF
(0532) 667183
19/3

Spectrum 48K special introductory offer, free diary system with the Bank Account System, written to professional standards, full screen entry, maintains transaction file of Standing Orders, Salary, Cheques, etc., prints statements, why wait for the Bank, cassette and user manual, £5.00, Kim Gouldstone, 45 Burleigh Avenue, Wallington, Surrey, SM6 7JG.
32/7

Spectrum Programming. Learn Basic Programming the easy way with our fully structured cassette course. Let the computer teach you! 250K of programs ending with a computerised exam. Only £9.95, Barclaycard accepted. Sussex Software, Wallsend House, Pevensey Bay, Sussex.
55/2

ORIC-1
ZX81
SPECTRUM

MANAGEMENT GAMES

DALLAS. A game of oil exploitation in Texas. Decisions are required on purchasing concessions, the movement and use of drilling rigs, and the building of platforms and pipelines. Can you takeover the Euing Empire.

AIRLINE. You must decide on number of aircraft to operate, loan and fuel contracts, whether to buy or charter, and levels of staffing and maintenance.

PRICE	*One*	*Two*
ORIC-1 48K	£8	£14.50
ZX81 16K	£5	£8.50
SPECTRUM 16K	£5	£8.50
SPECTRUM 48K	£6	£10.50

C.C.S. DEPT. YC
14 Langton Way London SE3 7TL
50/3

• IMMEDIATE DELIVERY •

SPECTRUM

MICRO IQ
BECOME AN EXPERT IN COMPUTER KNOWLEDGE
9 PROGRAMS (OVER 100K)
1,000 MULTI-CHOICE QUESTION/ ANSWERS.
LEARN RARE POKES
IMPROVE YOUR PROGRAMMING.
M/CODE & BASIC 16/48K
Hi-res. Colour Sound etc.
Send Cheque/P.O. to:
M.K. CIRCUITS
36 ST IVES CRESCENT
GRIMSBY DN34 5SJ
25/3

MZ80K/A Horserace Analysis, Winners galore. A serious program. Cassette: £5.75. Details: Paragon Moorside Woodlands Wimborne Dorset.
26/1

Wanted Urgently! Arcade-type games programs for micros — Spectrum, VIC 20, Dragon, Oric. We pay top royalties or cash outright for good exciting games. National marketing ensures maximum reward for your work. Phone David on 061 8329143 or write Northwish, Ground Floor, Ralli Building, Stanley Street, Manchester M35FD and hurry.
2/3

LYNX
Software available NOW
MOONRESCUE: save the astronaut but watch your fuel — you must get back! ONLY £5 inc.
60 Outwood Road, Herald Green, Stockport SK8 3LZ
53/3

From Old Kent Road to Mayfair. The famous board game for the BBC Micro (32K) short and standard game options. Gamesave facility. Up to six players including the computer who will consider deals and offer exchanges. £6. I.A.S. Software, Dept. YC, 31A Hillfield Drive, Heswall, Merseyside.
9/3

Atom Adventure investigate strange happenings in the Old Manor — then try to escape. 12K M/C £6.00 from Fourth Dimension Software, 15 Killearn Drive, Paisley PA1 3DG.
43/2

BBC quality programs: Low prices. "Chess Clock" (16K) — £1.95. "Two-player Blackjack" (32K) — £2.45. Datum, 22 Chesterfield Road, Southport, Merseyside.
11/2

Sharp PC1211 with CE-122 printer-cassette also Sanyo M1001 with full cassette program library, spare paper, batteries etc. A complete pocket computer system. The lot £100. Part-purchase considered. Tel: 061-789 2408.
21/3

VIC 20 best and latest Software super new club with unbeatable offers. Hire a cassette or cartridge then if you decide to purchase it simply send us the balance and we will refund your hire charge or return the cassette and if desired hire another. Note no obligation to buy whatsoever. Save pounds, join Comclub today! Plus a Super Bonus! All subscribers may purchase a genuine Commodore 16K Rampack for £49.95 or an 8K for £29.95. Also if you decline this offer, then accept a free Comsoft Draughts (UNEX) cassette RRP £6 or Comsoft Wordsearch (8-16K) cassette RRP £8. Send for membership form and free catalogue to Comclub, 24 Alton Road, Aylestone, Leicester.
42/2

DRAGON GAMES

Three fast moving ARCADE style games written in machine code for your DRAGON.
SNAKES The only way to kill them is shoot them in the head. Your man may move anywhere in the forest. Snakes enter one at a time, if you don't kill it quickly another will enter. Up to 12 snakes at one time (if you live that long). Fantastic sound and graphics.
LANDER Land your space craft on one of the landing pads (score depends on chosen pad). High resolution picture of craft and lunar surface. Very impressive display.
INVADERS The old favourite. Features include 35 invaders, mother ship and three defenders. Six digit Hi-score + score counters. Nine selectable skill levels. All in High resolution COLOUR graphics and sound.
ALL THREE GAMES ON ONE TAPE (order DGT2) only £6.95 incl. P/P etc.
J. MORRISON (MICROS), 2 Glensdale St., Leeds LS9 9JJ.(0532) 480 987.
10/1

TEACHER? Spectrum owner? Use your machine. Mark book on cassette. Class list. Year list. Sort alphabetically. Input marks. Converts to percents, grades, ranks. Graph results. "Z" scores for clear comparison. Means, standard deviations. £4.60 for cassette and notes. Farris, 8 Thompson Road, Bolton. Tel: (0204) 45007.
13/1

WORTHWHILE PROGRAMS

16K ZX-81 and 48K Spectrum.

FIRST AID — teaches the principles of first aid. Fully scoring. Ages 13+.

COMMUNICATOR — Morse code, semaphore, verbal reporting, use of telephone. Ideal for cubs and scouts. £4.99 each. State machine. Cheques/POs to:

Network Computer Systems Ltd. 39 Bampton Road, Luton, Beds.
9/1

POOLS PREDICTION DATABASE We can supply English Football League results 1977-82 in computer format, with starter analysis programs — Disc/Tapes £15. (2 year tapes £7.50). Sinclairs BBC, Pet, VIC, TRS, IBM, etc. SELEC Software, 37 Councillor Lane, Cheadle, Cheshire. 061-428 7425 (Access/Barclay welcome).
15/3

BBC EDUCATIONAL PROGRAMS

Help your child to go streets ahead in maths

Send for details of our quality programs.
COTTAGE SOFTWARE, HEATHER COTTAGE, SELLY HILL, WHITBY, NORTH YORKSHIRE 23/1

BBC (32K) SPECTRUM (48K)

NEW RELEASES

INVISIBLE MAN — now for Spectrum! Also for BBC and VIC20 £5.95.
STORY A — BBC only — just like a story book, but you choose the plot. Ages 7-11 £6.95.
PUNC-MAN — BBC only — he gobbles the full stops. You put them back! £7.95.
REAL EDUCATIONAL PROGRAMS

chalksoft **SAE for details— Lowmoor Cottage (YC4), Tonedale, Wellington, Somerset TA21 0AL. 082 347 7117** 11/3

ZX81 and Spectrum educational and games software send SAE. B Horsfield 23 Lealholm Crescent Middlesrough. 27/2

No more eyestrain with your ZX81. Video inverter displays sharp white characters on solid black background TV screen. A toggle switch lets you choose between normal and reverse. The small PCB fits on top of the logic chip inside your ZX81. Kit £4, Built £5, includes easy to follow instructions, VAT/P&P. Send cheque/PO to: D. Fritsch, 6 Stanton Road, Thelwall, Warrington, Cheshire, WA4 2HS. Box No. 1 9/2

SPECTRUM EPROM CARD (£19.50)

Plugs into a Motherboard. (2 slot £16.95). Uses unused ROM space (14592-15615) and 2516/2716 (2K) and 2532 (4K) EPROMS. Tape Controller optional extra. (+£3.45).
Many possible uses including Special Char. Sets, M/C & BASIC. 6116 (2K) RAM + ADAPTOR (£9.95) plugs into ROM CARD. EPROM 31 (2K) (£9.95) programmed with RENUMBER (inc. GOTO, GOSUB, RESTORE, etc.). SPRITE Chars. printed from any start position, any magnification, rotated & reflected. WORD PROCESSOR for prepn. of TEXT with justification. UDG Char. Sets + many others.
Also available ZX81 EPROM-READ CARD (£8.75). EPROM 1 (with BREAKOUT, LIFE and TOOLKIT (£8.25), 2716 EPROM PROGRAMMER (£29.75), 25U P.S. (for Programmer) (£6.50). P&P £1 (U.K. only), £2 (overseas).
SAE please for extra details.
ORME ELECTRONICS
2 Barripper Rd., CAMBORNE, Cornwall 28/3

BBC 32K. Accurate simulation of WW2 Submarine attack on 'Tirpitz', written by ex-submariner. £6 for tape, charts etc. Soft Options, 6 Remigius Grove, Lincoln. 1/3

VIC-20 Software Cassettes, £3.95 each inc. postage. No. 1: The Raider, Spacewarp, Breakout. No. 2: Skier, Cowboy shoot-out. No. 3: Scramble. All for the unexpanded VIC-20, uses Hi-Res colour graphics and sound. Cheques/P.O.s. to A. Carter, Ewelme, Ewen, Cirencester, Glos. GL7 6BU. 38/2

DRAGON 32 or TANDY TRS-80 Colour

Lots of programs — lots of useful hints and information EVERY single month in "RAINBOW" an exicting new 200-page magazine from U.S.A.

Send £1.95 (plus large 56p s.a.e.) for sample issue to

ELKAN ELECTRONICS (Dept. YC), FREEPOST, 11 Bury New Road, Prestwich, Manchester M25 6LZ or telepone 061-798 7613 (24 hour service). 4/2

16/48K Spectrum: Compulsive, exciting, quality games. Example — Tape one) Bomber + Lunylander + Twentyone + Eggcatch £3.50 — Plus Serious Programs — Word-processor etc — from £3.50. SAE for brochure. Raysoft, 24 Court Avenue, Yatton BS19 4EP. 30/3

Dragon Tenpin Bowling (improved graphics) tape £5. G.M. Newman, 12 Malden Park, New Malden, Surrey. SAE for full list. 29/3

VIC-20 (Standard) games includes Meteors munchy blockbuster Chicken Dambuster synthesizer plus others £4.50 the lot on cassette. A. Duffin, 63 Manifold Road, Scunthorpe, South Humberside. 31/3

20 1K ZX81 Games: Duckshoot, Connect 4, Battleships, 4×4 O's & X's, Solitair, Blackjack, Stocks 'n' Shares + more. Cassette & instructions only £3.95! 5 16K: Frogger, Backgammon, Motorway, Fruit Machine, Hangman £3.95, or all 25 for £5.95. S. Kelly, 7 Atherton House, Harewood Road, South Croydon, CR2 7AL. 48/3

MZ80K, Dragon Crown 48K Epic Graphic Adventure, with m/c + Squash, m/c Favourite. Both for £5.00, Squirrel Soft. 33 Wilton Road, Edinburgh. 34/3

JUPITER ACE USERS CLUB

Newsletter, software (both games and utilities), adapter for ZX81 add-ons.
SAE for details.
Remsoft, 18 George Street, Brighton BN2 1RH 37/3

Spectrum/ZX81 Games £2.50/£1.50, Yahtzee, Magnus, Hangman, Solitaire, Odd One Out Plus Another. R. Kimpton, 39 Yates Street, Liverpool. 39/3

Sharp MZ80K/A Software ready for immediate hire from 50p. Send SAE for membership details and free catalogue. K-Soft Software Collection, 56 Bolham Lane, Retford, Nottinghamshire. 7/3

COMMODORE 64 — Vic 20 — Atari 400/800 — CGL Home Computer — the best chess computers — all obtainable at the lowest prices by mail order from:

DOSKA CHESS SUPPLIES
(Registered Commodore Dealer)
Poulton-le-Fylde, nr. Blackpool, Lancs.
Phone: 0253-899742
(evenings and weekends included) 14/3

Colour Genie Pools Program + Free Blank Data Tape £8.00 Spectrum Pools (+ Tape) £4.95. ZX81 version (no tape) £4.00. M.W. Holman, 60 Camperdown Street, Bexhill, E. Sussex TN39 5BE. 40/3

BAUG SOFTWARE
Introductory offer ATARI 7½% off hardware up to 20% off Software. Commodore and Dragon. 10% off ZX81 key-board £26.00.
Telephone 0232-621221 for details P.O. Box 123, Belfast BT10 0DB.

Save £1,000 on your mortgage repayment? Your Spectrum 16K will not only show you how you might, but also give you a versatile repayment calculator. It even writes to your bank manager to take advantage of this no extra cost method. Send £5 to Computa-Scheme, 55 Buckingham Road, Swindon, Wilts. 17/3

JUPITER ACE SOFTWARE from FORTH DIMENSION

ACE INVADERS
Stop the fast moving and weaving aliens before they land.
METEOR RACER
Dodge the rocks and the debris, three lives plus maximum score.
SPACE PATROL
Shoot the aliens, when in range and in your sights, but don't wait too long.

To help you write programs in Forth and understand more about the Jupiter Ace each cassette comes with full user notes giving details of program structure and covering specific points of interest. All programs 1K.
Cassettes: £3.95 each All 3 £9.95 inc p&p
Forth Dimension
32 Bathurst, Orton Goldhay, Peterborough, Cambs.
Turn your own software into money Top royalties paid 79/3

Teacheraid (16K £3.80) Teacher Data (48K £5.20) Spectrum owners use your machine. Classlists, statistics, graphs, sorts — rank and alphabetical, genuinely useful. Mr. B. Farris, 8 Thompson Road, Bolton BL1 6DF (Dragon version available). 52/3

FOR ALL YOUR »»VIC 20«« SOFTWARE

UNIQUE OFFER! . . . BEST VIC SOFTWARE LIBRARY.
SPECIALISTS (Over 70 Top Titles!)
Hire a cass. or cart. for a week, then, if you wish to buy it, keep it and send us the cost and we will REFUND YOUR HIRE CHARGE!
If you decide not to keep it, simply return it and maybe try another of our wide range. SO JOIN

:COMCLUB:
THE CLUB WITH A DIFFERENCE
TODAY AND RECEIVE ABSOLUTELY
FREE!......
COMSOFT DRAUGHTS or COMSOFT WORDSEARCH CASS. (unex. RRP £6). (8K-16K. RRP £8).
PLUS: Special Offers, comps, and newsletters! Write NOW to:
COMCLUB
24 Alton Road, Aylestone, Leicester LE2 8QA
For FREE CATALOGUE, MEMBERSHIP FORM, AND YOUR FIRST ORDER FORM . . . !
REMEMBER . . . IF IT'S GOOD THEN WE STOCK IT!!! 44/3

Dragon 32 — Five exciting games only £4.40. Bulls & Outs, Rattrap, Earth Defence, Maze-runner, Hamurabi. Argent Software Ltd, 25 Lynwood CHase, Bracknell, Berks. (YC). 24/3

Spectrum Graph Plotter. Draw your own Pie-charts, Bar-charts, Line Plots and Scatter diagrams with this very versatile package of five routines. £5 for tape (includes five tutorials/demonstrations) and full documentation or SAE for details. Topgraph Software, 106 Blundell Road, Luton, Bedfordshire. 47/2

BROKEN YOUR TV/ COMPUTER JOYSTICK?



Inside your yoystick handle is a white plastic insert. (The main cause of failure.) Stronger insert replacement now available. Supplied with full fitting instructions allowing you to be back in action in seconds.
Send £2.50/pair inc. p&p to: (YC)
Computer Supplies, 146 Church Road, Boston, Lincs. PE21 0JX 10/3

Dragon Missile Command protect the domed city of Spartia from enemy ICBM's beware of the deadly radiation cloud, superb graphics £3.95. S. Marsh, 18 Lamberhurst Road, Maidstone, Kent. 8/3

ORIC I
CASSETTE LEADS
Din to Din & remote jack plug
Din to 2×3.5mm jacks
1×2.5mm for remote
PRICE ONLY £2.50
Cash with orders includes p&p
CLARES
222 Townfields Rd, Winsford, Cheshire CW7 4AX. Tel: Winsford 51374. 58/2

Congo 32K BBC Graphical adventure. Survive crocodiles, fight cannibals etc, to find Doctor Livingstone £3.95. D. Smith, 23 Madison Avenue, Bournemouth.

TEACH YOUR CHILD



to **Tell the Time** and **Count Money** on your Spectrum (16K) Two Fun Graphics Programs on Cassette for £5.50 inc. p & p.
V. Sampson, Richmond House, Ingleton CARNFORTH, LA6 3AN
Poppy Programs 35/3

Spectrum 16K/48K, the classic 'Battleships' and 'Escape From The Crypt', a new adventure game. Full Graphics. Both games on one cassette for £5. R. Acton, 44 Beehive Lane, Basildon, Essex. 18/3

SMASH DRAGON 32 £7.00
A super "break-out" type game in high resolution graphics. Features include a demonstration mode and walls of increasing difficulty from a single wall up to a full three walls. Continuous display of score, best score and balls remaining.
FRUITA DRAGON 32 AND SPECTRUM 48K £6.50
A deluxe fruit machine featuring:— 4 drums, Spin, Respin, Hold, Gamble, Collect, Nudge, Bounce, Blind, Cancel and Jackpot. New drums manufactured for each game.
EVICTOR TM DRAGON 32 £7.00
SPECTRUM 48K £5.50
A reactive game with machine code for extra zip. Evict the aliens from their self-re-generating and defended base. Features lasers, phasor and bombs. 5 skill levels.
Special offer:— DRAGON 32 — all three for £18.00
SPECTRUM 48K — both for £10.00
All prices inclusive, mail order only, cheques or postal orders to:— WIZARD SOFTWARE, P.O. Box 23, DUNFERMLINE, Fife, KY11 5RW. Send large S.A.E. for full program catalogue.
Royalties and/or commission paid for superior quality DRAGON or SPECTRUM software. 60/3

Acorn Atom 12K RAM 12K Rom Books, Software 8 months old £135. Tel: Derby (6332) 514033. 59/3

ZXcrabble 16K ZX81 word game program, 2-6 players, cassette £4.50, Aksoft, 18 Postmill Close, Ipswich IP4 2RF. 58/3

ZX SPECTRUM-CP48
32K Memory Extension
Gives total of 48K. Simply fits internally on series 2 models with no soldering. Similar to competitors but only £24.50. Fitted by our engineers (don't send power supply) £31.50.
CITADEL PRODUCTS LTD.
Dept. YC, 50 High St., Edgware, Middlesex, HA8 7EP.
Tel: 01-951 1848 36/3

MZ80A Sharp 32K Micro, Software pack, Music compiler, UK map programs £425. Tel: Basingstoke (0256) 56356. 22/3

WANTED URGENTLY

Arcade-type games programes for Spectrum, ZX81, Vic20, Oric, Dragon, BBC Micro and Lynx.
We pay top royalties or buy your copyright for cash. National mail order and dealer sales ensure you get the best reward for your genius.

Write or call into
NORTHWISH LTD
THE GROUND FLOOR, RALLI BUILDINGS
STANLEY STREET, MANCHESTER
M3 5FD
or Phone 061-832 9143



We Pay Hard Cash for Software

Weekend courses in Sinclair Basic, starting February 1983. 15 hours of instruction from a qualified lecturer, Friday evening to Sunday evening.
Luxurious 3-star Worcestershire Hotel, all rooms with bath and other facilities.
£55.00 inclusive.

GAINSBOROUGH HOUSE HOTEL
Bewdley Hill, Kidderminster
(0562) 754041

1/1

TEXAS
TI 99/4A
CASSETTE LEADS
£4.95
INCLUDING POST AND PACKING
Single Recorder only
Orders to:
Clares, 222 Townfields Road, Winsford, Cheshire CW7 4AX
Tel: Winsford 51374

Dragon 32 Merge Programs. Programs can be fully merged on the Dragon 32. For full details and instructions send £1 plus SAE to G. Grimwood, Allenwoods, 105 Conway Road, Colwyn Bay, Clwyd.
55/3

AT LAST!
BBC MICRO GRAPHICS PAD
FANTASTIC VALUE!
A high quality, cartridge paper pad featuring Graphics, Teletext screens and user-defined cells. Plus easy reference commands sheet. All for an incredible £1.99 + 65p p&p.

Hermes Computer Products Dept YC2
10 Barlow Moor Close, Norden, Rochdale, Lancs. OL12 7RN
6/3

Acorn Atom 12 + 12, Colour, BBC Basic Board, Forth, Software £150 o.n.o. London Area. Hornchurch 47549.
57/3

DRAGON 32 AND SHARP MZ80K SOFTWARE

Games Packs — £6.50 each.
Games Pack 1 — Bowling, UFO, Muncher, Micropoly, Mastermind.
Games Pack 2 — Race-chase, Depth Charge, Motor Cross, Glorious 12th, Canyon Bomber.
Games Pack 3 — Tank Battle, Reaction Time, Blind Maze, One Man and His Dog, Life.
Game Pack 4 — Poker, Pontoon, Roulette, Othello, Stock Broker.
(Sharp only)
Adventure Games
Devils Triangle — Sail to Bermuda but beware of the Bermuda Triangle! — £5.00.
Earth Rescue — Search the Galaxy for a rare mineral needed for Earths survival — £5.00.
King of the Valley — Try to control a kingdom and its people — £3.00.
Desert Patrol — Find your way across a desert but beware of its inhibitants! — £4.00.
Educational
Maths Tutor — A set of programmes designed to teach maths to children from 3-10 yrs. — £5.00.
Word Quiz — Find the hidden words in a jumble of letters — £3.00.
Send cheque/PO or SAE for details to

Abacus Software
20 Rhosleigh Ave.
Sharples Park
Bolton BL1 6PP.

VIC-20 (unexpanded) Games Tape (No. 2): Bombers, Break Out, Nibbles, Froggy, Space Gobblers, Bank Robber. All 6 for £4.95p inc. P&P. Fast delivery from: Starraker, 21 Hoyle Road, Hoylake, Wirral, L47 3AG.
50/2

THE MZ 80K SOFTWARE LIBRARY

Choose from 150 titles. These include exciting Arcade/Adventure games, and Educational/Business applications. Once only membership fee £10.00. Hire charges only 90p per 14 day period. Plus your first 5 games **FREE**. Send now for illustrated catalogue to:

The Yorkshire Software Library
13 Park Top, Pudsey,
West Yorkshire, LS28 6BY
34/3

BBC USERS?

Explore all your medes.
Create your own unique graffic's displays with the Hermes Graphics Pad. All models plus teletexed plus user defined cells and commands sheet. Only £2.59 plus 65 pence p&p.

Hermes Computer Products
10 Barlow Mor Close,
Norden, Rochdale, Lancs.
OL12 7RN
38/3

BBC (32K) or **VIC20** (6.5K)

NEW COMPUTER? Try our guaranteed software — for parents and children (ages 4-15) who want to do more than just shoot aliens!
LETTERS (BBC only) — ages 4-6: learn the correct way to form letters with our Magic Pen! Teacher checked. Great graphics. **£9.95.**
INKOSI — Be an African King! Adventure for ages 10-adult — can you beat the witch doctor? £5.95.
INVISIBLE MAN — Co-ordinates game with good sound and graphics, ages 7-14 £5.95.



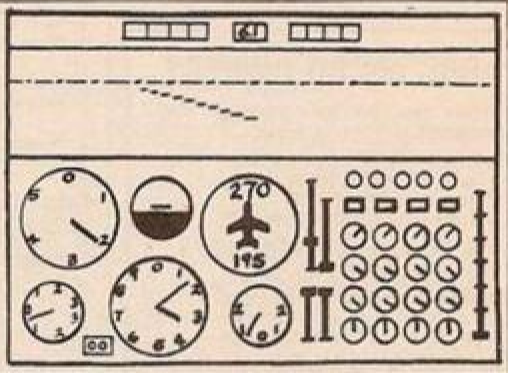
. . . and more!!
Send SAE for details:
Lowmoor Cottage (YC2), Tonedale, Wellington, Somerset TA21 0AL
082 347 7117
7/1

Battleships against Computer, simultaneous display of boards, ZX81 (16K), £4.25, Dragon, £5.50. Cheques to R. Simmonds, 2 Argus Walk, Crawley RH11 8BQ.
5/3

Diet and weight control program for VIC 20 and CMB 64 helps and advises you on the best slimming diet. Cassette £12, disk £17. E. Frangoulis, 54 Holland Road, London W14 8BB.
46/3

Spectrum Forth on cassette. Faster than Jupiter Ace. All structures, colour, Hi-res. Order as SP16D (16K) or SP48D (48K) £5.95 to Mike Hampson, 7 Hereford Drive, Clitheroe, BB7 1JP.
54/3

DRAGON-32 AND BBC MODEL B
747 FLIGHT SIMULATOR
Superbly realistic instrumentation and pilots view in Hi-Res graphics. Lifelike simulation including emergencies such as engine fires and hydraulic failures. This 32K program uses the Dragon's excellent graphics facilities to the full to produce the most realistic instrument display yet seen on a home computer. There are 21 real dials and over 20 other indicators (see diagram). You control throttle, ailerons, elevators, elevator trim, flaps, slats, spoilers, landing gear, brakes, reverse thrust and see the runway centreline in true perspective. Uses joysticks and comes with bound 12 page manual. Includes options to start with take-off or random landing approach and restart. Cassette £9.95 (PP and VAT included).
D.A.C.C. LTD., 23 Waverley Rd., Hindley, Gtr. Manchester WN2 3BN.



SELL IT WITH YOUR COMPUTER CLASSIFIED ORDER FORM

Classified Rates

Linage: 30p per word (Min 15 words) — prepayable

Linage advertisers should complete the form provided in BLOCK CAPITALS. Phone number counts as 2 words. Name and address to be paid for if used in advertisement. Box Number if required is £3.00 extra.

Display — rates per scc (Min 2scc)

One Insertion	£7.00
Three Insertions	£6.70
Six Insertions	£6.50
Twelve Insertions	£6.00

Display advertisers should provide separate copy and preferably reserve space by phone (01-661 3036).

Method of Payment

Cheques etc, should be made payable to Business Press International Ltd, and crossed. I enclose herewith cheque/PO for

£. . . . .

Please debit my Access/Visa Barclay Card/American Express/Diners Club Int/ as below

SIGNATURE

Post to:
Cut out the order form and return together with your remittance to:
Classified Department, Your Computer, Room H211, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.
(01) 661 3036

Please insert the following advertisement in Your Computer Classified Section

					LINAGE
					£4.50
					£6.00
					£7.50
					£9.00
					£10.50
					£12.00
					£13.50
					£15.00

No. of insertions required ☐ Box No. required YES/NO

NAME *(Please include initials)*. . . . .

ADDRESS . . . .

. . . .

. . . .

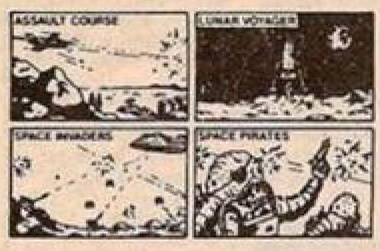
Payment by credit card please state address card is registered

Daytime tel. no . . . .

THIS FORM SHOULD BE RETURNED BY APRIL 28 FOR MAY ISSUE PUBLICATION

Company Registered Number: 151537 (England) Registered Office: Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

SPECTRUM — TRS80 LV.2 VIDEO GENIE SOFTWARE



We offer a great selection of games and utilities from many leading software houses at reduced prices. As a special offer, to introduce you to our software, we are giving away, well almost, a software pack with a super variety of 25 full length programmes on it, and all for only £7.50!!! Do not miss out! Send for your illustrated catalogue today. Please enclose an s.a.e.

SPARTAN SOFTWARE
DEPARTMENT YC
9 Cotswold Terrace,
Chipping Norton, Oxon.
Telepone:— 0608-3059.

31/1

ZX81 Fast Load and Save. 4Xs faster than normal £5.00. Amazing Software, 34 Aslands Sale, Manchester.

7/3

BBC MICRO OWNERS

Would you like your existing BASIC programs to:

- Take up to 60% less memory
- Load up to 60% faster
- Run up to 60% faster

without buying more hardware?

Yes? Then you need The Optimiser.

The Optimiser is a two-stage program compacter *and* variable optimiser. It runs on a model A or B is available now on cassette price £4.50 inclusive from:

S. Cardy, 12 Elmdene Avenue, Hornchurch, Essex RM11 2QH

(Mail order only)

Or send a stamped addressed envelope for more details.

43/3

Spectrum software library. Weekly hire from 50p. Try programme out before you buy. Send stamp for free catalogue to Thomas McQueen. 25 Blenheim Gdns; Brixton Hill, London. S.W.2.

50/1

ATOM PROGRAM AIDS

£15.95 each (incl VAT)

TWODIL BOARD
Enables two EPROMS to be switch selected. Plugs into IC24 on the ATOM via ribbon cable.

UTILITY ONE
A machine code monitor for the ATOM. Includes Disassembler, Transfer memory, Registers, Fill memory, Proto-programmer routine.

BTR ELECTRONICS
(Dept YC)
68 MILL ROAD AVENUE
ANGMERING VILLAGE
SUSSEX BN16 4HS
TEL. [illegible]
(EVES & WEs ONLY)

Chemistry Exams? No probelm with Alchemy Software. 6 programs each with entensive notes covering formulae, cacultations for O/CSE for ZX81 and Spectrum. Send SAE for details. 78 Tweendykes Road, Hull.

62/3

GARLAND COMPUTING

educational software for the BBC and Dragon

Ohm enables you to simulate an experiment to verify Ohm's Law. Dragon — £9.00.

Motor learn the principles of the DC motor. Dragon — £9.00.

Heart learn the anatomy of the heart and how blood flow and electrical activity are co-ordinated.
Dragon — £11.00 BBC (32K) — £11.00.

Seed test the effects of various conditions on seed germination.
BBC (32K) — £16.00

Plus many more

Prices inclusive of VAT and P&P. Send for full details of our extensive range of software for school and home use.

GARLAND COMPUTING
35 Dean Hill, Plymouth PL9 9AF

26/3

SPECTRUM 32K RAM — £24.50

Upgrade your 16K Spectrum to 48K with our RAM kit. Only fits Issue 2 machines, identified by a large chip in a socket in line with the "9" key, visible through the rear expansion cutout. The kit consists of chips and instructions, and NO soldering is needed.

£24.50 incl. VAT and P&P.

HAPPY WITH YOUR DISPLAY

Or have you got problems?

- Are your whites yellowish?
- Is every other line a different colour (like Venetian blinds)?
- Do your characters wobble?

(Some character wobble is bound to exist, but it can be reduced)

We have prepared instructions to allow any Spectrum to give the best possible results, by adjusting internal controls.

Send £1 plus SAE. *(Sent free if you order the RAM).*

FOUNTAIN COMPUTERS LIMITED
Darvill Road, Ropley,
ALRESFORD, SO24 0BW

25/3

Vic-20, 16K, 8K, 3K packs, Cassette Deck, Printer, Joystick, over £250 software inc. Viewriter Word Processing and prog. Aid plus many games. Total cost around £1,000 will sell for £700 o.n.o. Tel (0204) 493428 or contact 1120 Chorley Old Road, Bolton for this great bargain.

64/3

BBC MODEL B QUALITY SOFTWARE — KEEN PRICES

DOMGRID
Unravel the mystery pattern of dominoes created by the computer (a new problem every time).
Deceptively thought-provoking.

WORDGRID
The computer hides your words in the word square — then your opponent has to seek them out on line (no printer required).

Sensible, family games with educational value. £3.95 (inc) the pair.
SAE for list of these and other programs.

Strawberry Software
78a Sunderton Lane
Clanfield PORTSMOUTH
PO8 0NT

13/3

Apple II 48K, Europlus, brand new, PAL card, Basic Compiler, Applewriter II, LS4.1, 30 games worth £500, total value £1,500, for £690. 01-402 5061, late evenings.

41/3

DEATH'S HEAD HOLE

You'll almost believe it's true!

It's skill, courage and your growing experience that count in this unique adventure for the Dragon 32 and BBC Model B, inspired by the real-life challenges facing a cave rescue team.

Literally hours of excitement — if you measure up.

After this, any other adventure will just be a game.

Only £5.45 by return of post from

WORDS AND PICTURES
7 Hawthorn Crescent,
Burton-on-Trent

4/3

MUSICSOFT

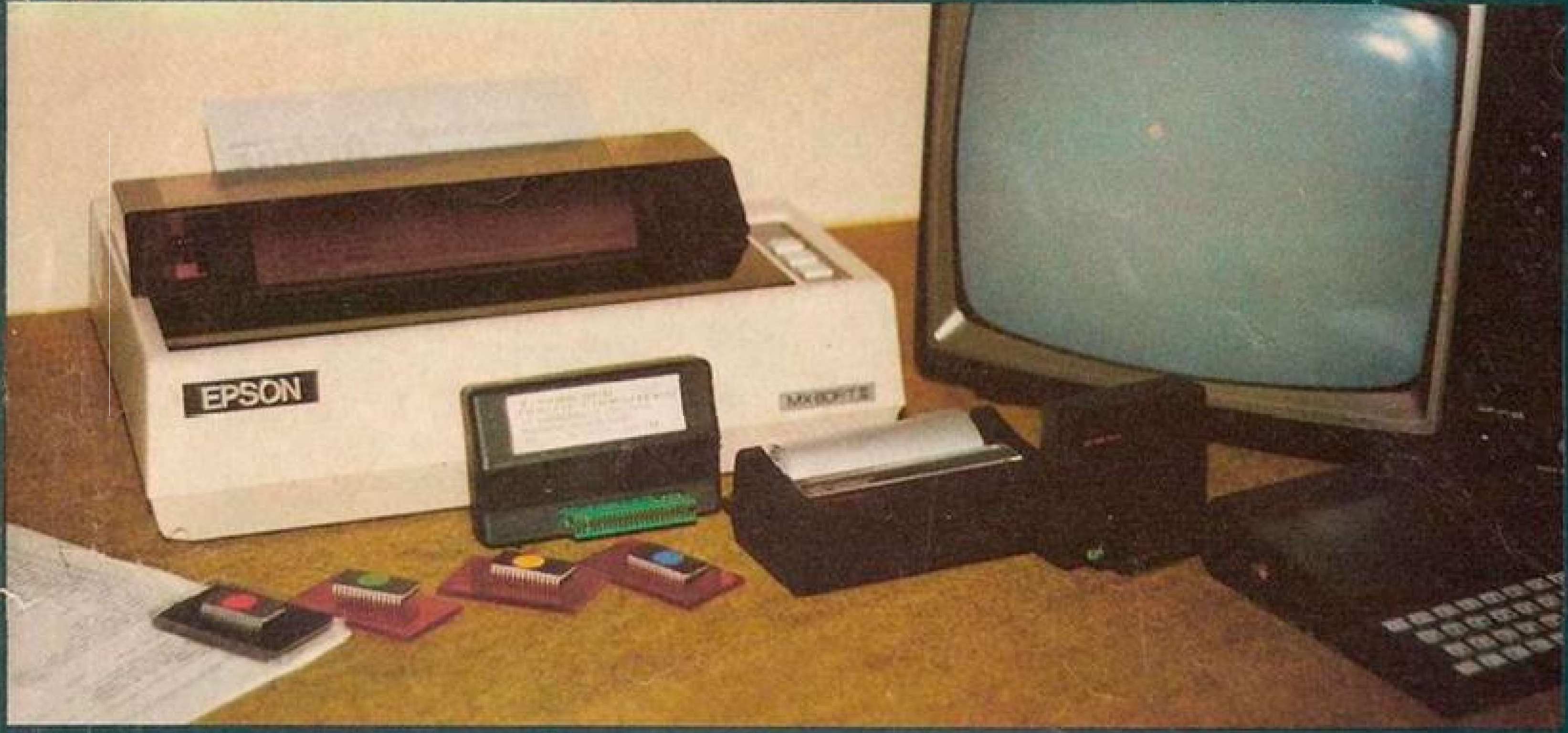
BBC MICRO 32K A/B.

5 music games of memory and dexterity. Multicolour graphics. Fun for 5 year olds yet frustrating for graduates. Variable speeds and scale levels. Cassette and Instructions £3.50

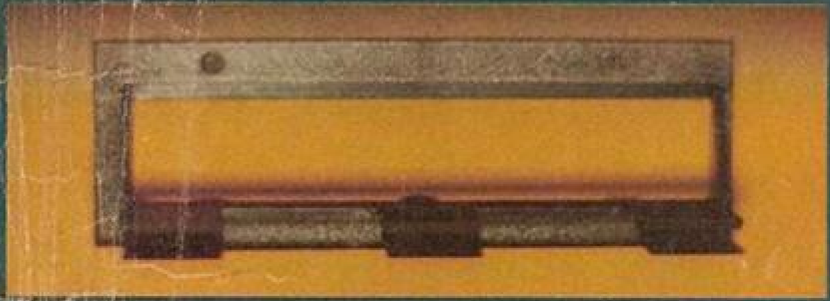
Cheques to Musicsoft
12 Fallowfield, Ampthill, Beds.

36/1

FIRST STEP FIRST TO A REAL SYSTEM



FIX-A-RAM OFFER



STOP THE RAMPACK WOBBLING

for only **£0.50**

post and packing included

Program crashes on the ZX81 are only too well known, but one of the most common reasons is *'wobbling'*.

The *Sinclair Ram Pack* is attached to the computer by a small contact area, as shown in figure 1.

We have designed what is much needed: a *plastic sleeve,* which is sandwiched discreetly between the Ram Pack and the computer, called the *FIX-A-RAM* (see fig. 2).

RESULT: *a perfect match and stability.*

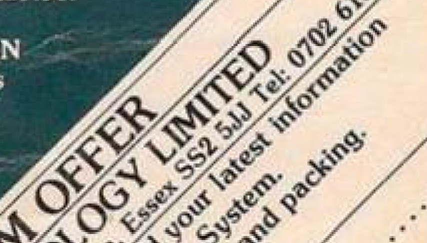
Your computer may still crash, but certainly not due to 'wobbling'. This example shows how we work to enhance the ZX computer system. *We put the right thing in the right place and sell it at the right price.*

To find out more about what we make for the ZX81, why not send in for a FIX-A-RAM? We will send it to you by return, together with 'THE LIST' — full details of our hardware and software for the ZX81. *Please remember, details will only accompany the FIX-A-RAM.*

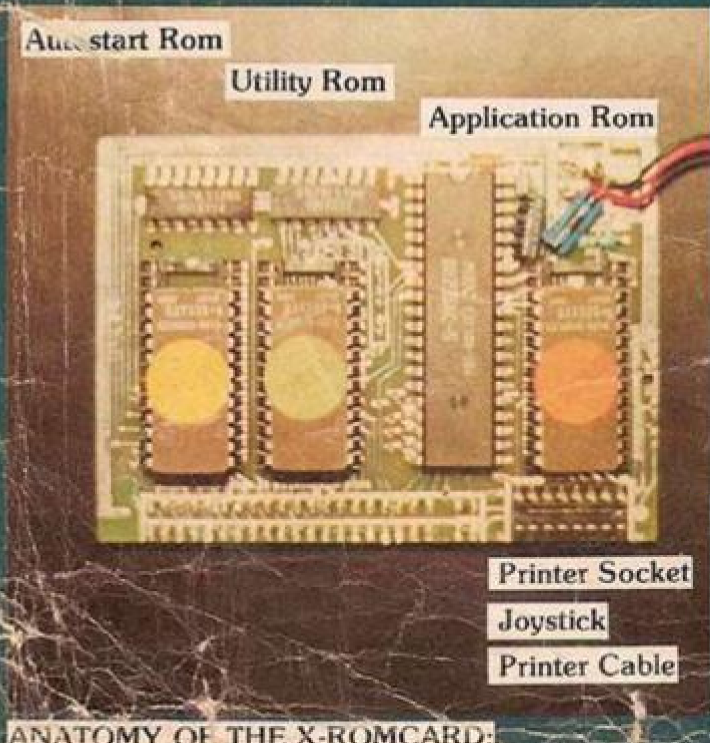
Fig. 1



Fig. 2



EXTRACT FROM THE LIST



ANATOMY OF THE X-ROMCARD:

- 'CALC' the giant electronic spreadsheet: up to 48 k of ram. Chip: £19.95 or Tape: £14.95.
- 'EDASM' the full editor assembler. Chip only: £19.95.
- Games chips from £4.95.
- X-ROMCARD (as illustrated): links up to EPSON printer, programs EPROMS from tapes or chips with built-in machine code monitor. £17.95.
- X ROMCARD II: enhanced version of the X-ROMCARD with Hi-Res (256 × 192) moving graphics. Extended BASIC, amplifier, speaker, joystick socket (for ATARI joysticks) DRAW pictures with joystick etc.

FIX-A-RAM OFFER

SOLIDISK TECHNOLOGY LIMITED

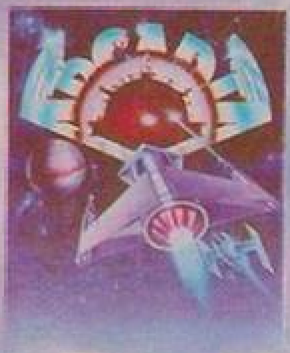
37 Bournemouth Park Road, Southend-on-Sea, Essex SS2 5JJ Tel: 0702 613081

PLEASE RUSH ME A FIX-A-RAM and your latest information on the SINCLAIR Computer System.

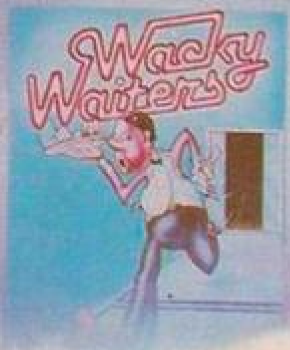
I enclose £0.50 for FIX-A-RAM, post and packing. (Sorry no cheque accepted).

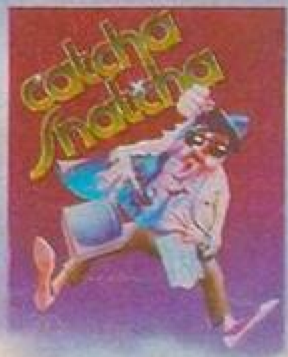
NAME: ....

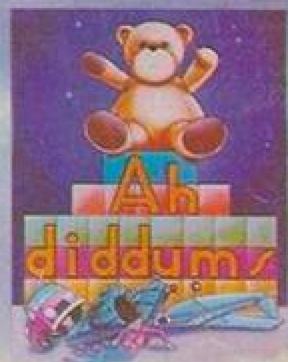
ADDRESS ....











..the name of the game

Imagine Software, Masons Buildings, Exchange Street East, Liverpool, Merseyside L2 3PN. Telephone: 051-236 0407

More K's.



ATARI 800.™ No price increase. Upgraded from 16K to **48K RAM.**

Less £'s.



ATARI 400.™ Reduced from £199.99 (S.R.P. inc. VAT) to **£159.99.**



At prices like these, they m
Here's a c

From today, we've upgraded the ATARI 800 to 48K, but we haven't upped the price by a penny. It's still £399.99.

As for the ATARI 400 it's reduced by around £40. Now take a closer look.

ATARI 800 and ATARI 400.
The straight facts.

Computer console: FCC approved, with built-in RF modulator. Connects to any standard colour or black & white TV.

Colour: Choose from 16 colours, and 16 intensities.

Sound: Four independent sound synthesisers for musical tones or game sounds. Four octaves. Variable volume and tone for each channel.

Display: Three text modes: 24 lines of 40 characters; double-width characters. Nine graphic modes: from 40 columns by 24 rows up to 320 columns by 192 rows.

Keyboard: 57 alphanumeric keys plus 4 special function keys. Inverse video. Upper/lower case.

Full screen editing. Four-way cursor control. 29 graphics keys. Full stroke keyboard (ATARI 800) and mono panel keyboard (ATARI 400) for fast, easy data entry and interaction with the computer.

I/O: Serial input/output port for simple connection to peripherals. Four controller jacks for joystick and paddle controllers.

Memory: Includes a built-in 10K Read



ust be worth a closer look.

loser look.

Only Memory (ROM) Operating System with 48K Random Access Memory (ATARI 800) and 16K Random Access Memory (ATARI 400). ROM may be expanded with user-installed cartridge programs.

CPU: 6502B Microprocessor. 0.56 micro-second cycle. 1.8MHz.

Language: Atari BASIC Cartridge is included with ATARI 800. Also programmable in Atari Microsoft BASIC, PILOT, PASCAL, extended Fig. Forth and assembly language.

Monitor: With the ATARI 800, if desired, a monitor jack allows composite video output for connection to a colour or black and white monitor (in addition to a standard television set).

Owner's guide: Atari BASIC Self-Teaching Guide and Atari BASIC Reference Manual included with ATARI 800.

Extended graphics functions: Hi-resolution graphics. Multi-coloured character set. Software screen switching. Mixed text and graphics modes.

Multiple redefined character sets. Player missile (sprite) graphics. Fine screen scrolling in any direction. Changeable colour registers. Smooth character movement.

Software: Self-teaching programs with the unique voice-over. Home Management. Education. Programming aids.

And of course Atari's famous entertainment software.

Peripherals: A complete range of peripherals and accessories that are available now.

Why you'll feel more at home with our computers.

Before we designed our computers, we thought about who was going to use them.

One day, our computers might be playing games; next, they're wrestling with household budgets; teaching geography to an 8-year-old; or printing 2,000 letters.

In other words, we designed our computers and software for as many applications as a family has ideas.

(Now the ATARI 800 has 48K RAM, there's even more memory for even more applications.)

Next, we built in high-resolution graphics. Inside our computers, we have a microprocessor whose only job is to operate our graphics.

(All told, you can choose up to 16 different colours from a spectrum of 256 different shades.)

In fact, Atari computers divide the screen up into 60,000 tiny points, each one of which can be changed without affecting the other.

On screen, you can even blow up a line of type to quad size (invaluable if you're teaching a child to read).

We also looked at ways to make computers rather friendlier.

On the ATARI 400, we've incorporated touch-sensitive keys with ridges, so fingers won't slip; on the ATARI 800, we have keys much as you'd find on a standard typewriter.

You talk to your computer in a choice of languages, including ATARI BASIC, using software which you load in on cartridge, cassette, or disk.

At Atari, we have one of the largest software libraries in the world (some of our current titles are on display on this page).

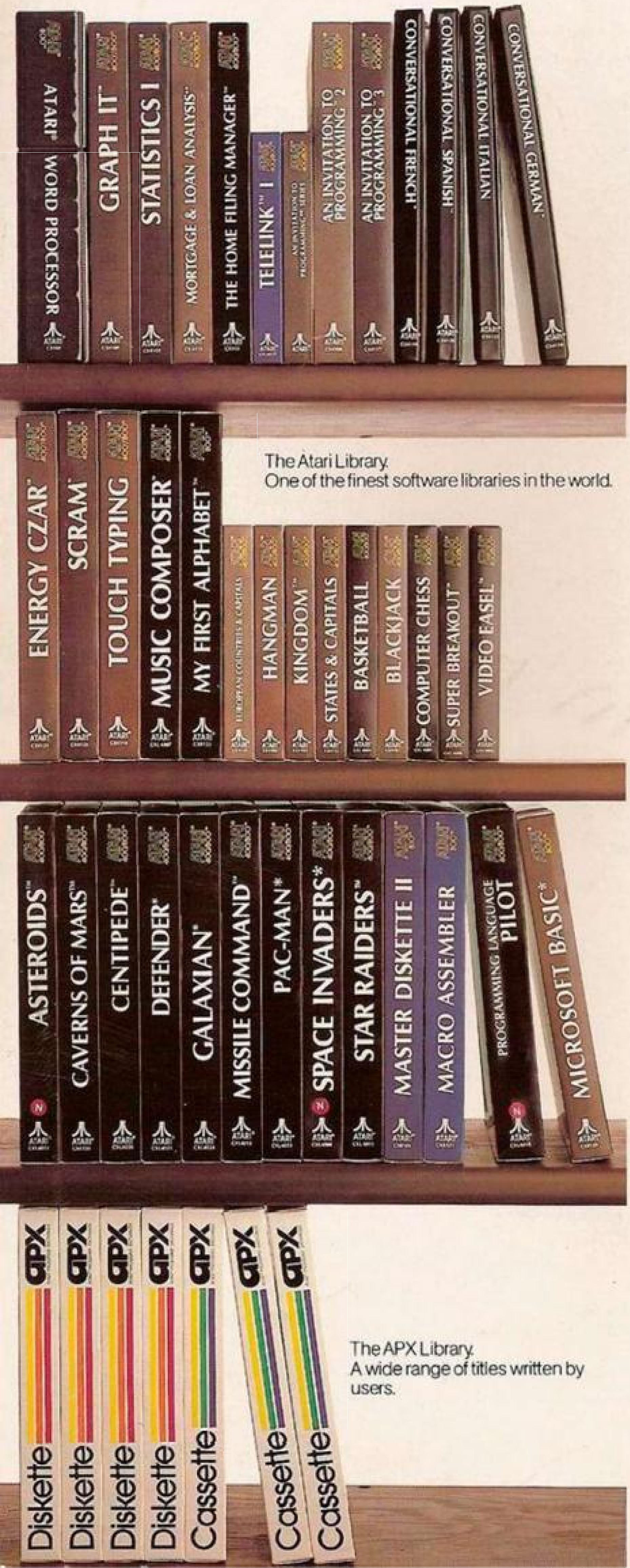
No doubt you know all about our games, but we also boast home and office application software as well as educational programs to satisfy the most enquiring mind.

At the same time, through Atari's Program Exchange (APX), you can have access to a wide range of the most imaginative programs written by our users.

Or you can learn to write your own programs with the help of our 'Invitation to Programming'™ series, using our unique 'sound through' system.

Surprisingly, you won't have to plough through a small library of manuals to do so, since most of the series is on software, not in hard books. Of course, we've always had just about everything you're looking for in computers.

From today, we've got even more.



The Atari Library.
One of the finest software libraries in the world.

The APX Library.
A wide range of titles written by users.

ATARI®

Home computers you'll feel at home with.

™are trademarks of Atari Inc.® ATARI and design. Reg. in UK.